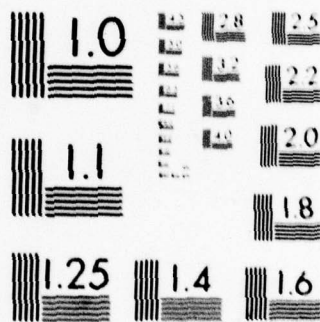| OF |

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UNITED STATES MILITARY ACADEMY

WEST POINT, NEW YORK

Claude F. /Bridges

THE DEVELOPMENT OF GUIDANCE MATERIALS FOR CADETS IN THE SELECTION OF THEIR AREA OF CONCENTRATION

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OFFICE OF THE
DIRECTOR OF INSTITUTIONAL RESEARCH

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Report Number: 79-006
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Prepared by: Claude F. Bridges
Dean's Representative: LTC David J. Phillips
Programmer: Felicia J. Pittard
Typist: Shirley Sabel
Research Aids: Maryjo Cervera
               Eileen Gaughan

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THE DIRECTOR OF INSTITUTIONAL RESEARCH
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The Development of Guidance Materials for Cadets in the Selection of Their Area of Concentration

ABSTRACT

A guidance program and techniques to assist cadets in selecting the area of concentration most compatible with their profile of measured interests, values and academic capabilities were developed on the Class of 1978 and cross-validated by application to the Class of 1979.

The new measures of compatibility between a cadet's pattern on selected interests and values and the pattern of cadets typical of those successful in the two more popular areas of concentration (the Applied Science and Engineering area and the National Security and Public Affairs area) had high validity (respective r's = .71 and .67), on the Class of 1978 from which a sample was used to develop the techniques and high cross validity on the Class of 1979 (respective r's = .68 and .65). Compatibility scores developed for both the Basic Sciences and Humanities areas were based on samples that would be completely inadequate in size if the traditional techniques were used. However, their respective validities on the Class of 1978 were .68 and .64 and their cross validities were still promising (.34 and .31), but indicated that further refinement is necessary.

The four area Predicted Quality Point Averages had exceptionally high validities and cross validities ranging from .86 to .93 for the Class of 1978 and cross validities of .79 to .92 when applied to the Class of 1979.

A Physical Science Areas/Non-Physical Science Areas Score (A,B/N,H) had a correlation of .90 for the developmental sample, .85 for the total Class of 1978 and .83 for the Class of 1979.

Such consistently high validities indicate high potential for improving the matching of a cadet's special characteristics with his area of concentration and increasing his satisfaction and success at West Point.

A new statistic is presented that indicates the reliability of differences between scores on two scales, based on the correlation between the two and on their two reliability coefficients.

Further developments will follow trial use of the techniques to help guide the Class of 1981 Cadets in choosing their area of academic concentration.

DEVELOPMENT OF GUIDANCE MATERIALS FOR CADETS IN THE SELECTION OF THEIR AREA OF CONCENTRATION

EXECUTIVE SUMMARY

A. <u>Purpose</u>. To develop objective guidance measures to assist cadets in selecting the area of academic concentration most compatible with their interests and capabilities. This research was initiated 2 June 1978 at the request of the Office of the Dean.

B. <u>Methodology</u>.

1. Statistical techniques were developed: (1) to measure the compatibility of (similarity between) a cadet's pattern of interests and values, and those of cadets successful in each area of concentration; (2) to predict the level of success in each of the areas; and (3) to provide one overall measure, combining compatibility scores and predicted success scores for each area of concentration, to assist cadets in deciding between a physical science area (Basic Science and Applied Science areas) and a non-physical science area (Humanities and National Security & Public Affairs (NSPA)). The next three paragraphs address these in more detail. Data on the Strong-Campbell Interest Inventory and Rokeach Value Survey tests, and grades earned in secondary school and at USMA before choosing an area of concentration were available on the cadets who graduated in the Class of 1978. These data were used to develop a special scoring technique and regression equations for prediction of each of the three criteria. In addition to construct validity, evidence on cross-validity was obtained by applying the equations developed on the Class of 1978, to the Class of 1979 (as of December 1978), and comparing predicted results with actual results.

2. For each cadet, three types of compatibility scores were developed for each area of concentration (see left-hand portion of Chart 1 sample report to academic counselors, page 28). The twelve scores indicate the degree of similarity between the patterns of an individual cadet and the patterns of successful cadets (defined as those cadets who graduated in the top half of their area of concentration) in their: General Interests, Occupational Interests, and Values. When these twelve scores were combined with optimal weights to predict membership in a given area of concentration vs. the other three combined at graduation in the Class of 1978, the corrected* multiple correlation of the scores with membership in a given area are <u>.71</u> for Applied Science, <u>.68</u> for Basic Science, <u>.67</u> for National Security and Public Affairs, and <u>.64</u> for Humanities. (Note: In a multiple correlation, several independent factors (in this case, the twelve scores) are weighted in terms of their combined importance as a means of explaining the differences in the dependent variable (in this case, graduation in an area of concentration)). When applied to the Class of 1979, the corresponding cross-validity correlation for each respective area was <u>.68</u>, <u>.34</u>, <u>.65</u>, and <u>.31</u>, indicating high continuing validity for both the Applied Science and the NSPA areas (that had the larger number of cases) and promising, but relatively low, validity for the other two areas.

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*Due to the relatively small proportion of the complete data sample in areas "B" and "H", the obtained correlations for these two areas were underestimates of the relationship and are not comparable with the others. A correction factor was used to make them comparable (explained in the body of the report).

3. For each cadet, a Predicted Quality Point Average (PQPA) in each area of concentration was developed. Each score is compared to a success band, indicating the probable QPA bands among cadets with his pattern of interests, values and past academic achievement, who graduated in each area of concentration (see right-hand side of the proposed Guidance Report to Cadets). The correlations between predicted area QPA scores and actual QPA, by area of concentration in the Class of 1978, and the cross-validities found when applied to the preliminary Class of 1979 area QPA's near the end of the seventh term (shown in parentheses) were as follows:

    a. Applied Science .86 <u>(.82)</u>

    b. Basic Science .93 <u>(.92)</u>

    c. National Security and Public Affairs .87 <u>(.88)</u>

    d. Humanities .92 <u>(.86)</u>

It should be noted that although the correlations are high for both the initial sample and the preliminary validation sample, this does not mean that they are necessarily well suited to discriminate among areas of concentration. Unlike the compatibility scores, the high intercorrelations between the four indicate that, in general, a cadet who would earn a very high QPA in one area usually would earn a high one in another area.

4. The Physical Science/Non-Physical Science Score results from combining the cadet's selected compatibility and Predicted Area QPA standard scores into one regression equation that most accurately distinguishes between cadets graduating in the Physical Science areas (Applied and Basic Science areas) and those graduating in the other areas (NSPA and Humanities). The corrected correlation between the Physical Science/Non-Physical Science Scores and membership in the Physical Science Group or the Non-Physical Science group was .90 for the sample on which developed, and <u>.85</u> for the total Class of 1978. When cross-validated on the Class of 1979, the correlation was <u>.83</u>, still remarkably high.

C. <u>RESULTS AND DISCUSSION</u>.

1. An end product, a proposed "Area of Concentration Selection Guidance Report" is shown as Chart 1. It is designed for distribution to the Academic Counselors to help them in counseling cadets in selecting an area of concentration. Shown as Chart 2 is a preliminary explanation and sample simplified summary, prepared by the Office of the Dean, for general distribution to cadets with their commercially produced SCII occupational interest profile.

2. The scores and predictions for individual cadets are based primarily on their past academic performance, so any appreciable changes in the effectiveness of their work-study habits will effect the accuracy of the predictions for them.

3. The differences between the scales for the Predicted Area QPA standard scores reflect the effects of: (1) the different cadet courses whose grades were used to predict cadet success in each area of concentration; (2) any differences in academic ability of the cadets enrolled in each area; and (3) any differences in difficulty of the courses.

4. The 17 scores to be reported to cadets all have very high reliability coefficients. (The Spearman-Brown Prophesy Formula yielded estimates of .94 for Rokeach Value based area compatibility scales and .99 for all of the Strong-Campbell Interest Inventory based area scales.)

5. The 66 intercorrelations between the 12 compatibility standard scores indicate that, altogether, they can provide useful discrimination between the areas (the median intercorrelation is .32). About half of these correlations are positive (indicating a direct mathematical relationship), and half have negative signs (indicating an inverse, mathematical relationship). These scores for the two Physical Science areas tend to have negative correlations with scores for the other two areas, and vice versa.

6. The high intercorrelations between the four Predicted QPA standard scores (.86 to .97) indicates that, in general, a cadet who would earn a relatively high (or low) area QPA in one area would also earn a relatively high (or low) area QPA in the other areas. There are useful differences between cadets' Predicted QPA's for the six area pairings, but development of more discriminating functions may be required. However, careful guidance is required for accurate interpretation of the difference between the current PQPA's for two areas.

7. Most of the weight in the predictions of Area QPA goes to the cadet's previous academic performance, but the values and interest measures also contributed significantly to increased accuracy of predictions in all except the Basic Science Area. The percent of total prediction of actual Area QPA from each measure is as follows:

Area	USMA Academic Performance	H.S. Rank	SCII Interest	Rokeach Values
Applied Science	71%	3%	14%	12%
Basic Science	88%	10%	-	2%
NSPA	77%	2%	11%	9%
Humanities	65%	-	21%	14%

8. Although the individual interest and values compatibility scales do not now have a very high correlation with being in the given area group (when corrected for differences between the proportions of the class in each area, the correlation coefficients estimated from the point-biserial correlations range from .29 to .65, with a median of .54), each relationship is high enough to provide useful guidance, even when considered alone.

9. The loss of cadets with missing data on any variable reduced the number of cases to 171 in some of the final analyses. Though the descriptive statistics indicated no major differences between the characteristics of the reduced samples and the characteristics of the total group in each area, the smaller number remaining in the Basic Sciences and the Humanities areas of concentration suggests that the predicted Area QPA scores for these two areas are likely to be less valid than will the predicted Area QPA's for Applied Science and NSPA.

ADDENDUM

In the experimental implementation of these area of concentration guidance materials, in April 1979 for the Class of 1981, the area compatibility scores (Section 1 of Charts 1 and 2) were reported to a sample selected as the experimental group. All cadets received the copy of the regular Strong Campbell Interest Inventory Profile (as produced by a commercial scores service) from their company academic counselor. Thus, the new program was introduced using only the portion whose interpretation, use, and technical caveats are less demanding of the counselors. Most of the company academic counselors have had relatively little professional training in guidance and many of them do not have a very complete understanding of statistical regression characteristics.

Furthermore, in their current form the four area predicted QPA's (PQPA's) have very high intercorrelations which when coupled with the usual tendency of "true" scores to be closer to the mean on the criterion variable than "predicted scores" (known to statisticians as the regression tendency) necessitates careful and statistically sophisticated guidance and accurate interpretation of the differences between the current PQPA's for two areas, applying the explanations given in the report.

This initial developmental process was designed especially to determine if useful prediction of area QPA's could be obtained, not to maximize the differentiation between success in closely similar areas. Furthermore, the difference between the Basic Sciences and Humanities areas and the number of cases in the two larger areas allowed differentiation between the two larger areas to dominate the statistics.

Until area PQPA's could be made more differentiating and their effective use simplified, it seemed best to omit them (Section 2 of Charts 1 and 2) from the special report provided to the cadets in the experimental group. Current plans envision a follow-up of results in the Class of 1981, appropriate refinement of the developmental, reporting, and interpretation procedures, as well as the exploration of the possibility of guidance materials pointing more directly towards special academic fields or small clusters of closely similar fields.

10. The complexities of such a new guidance program may cause some difficulty for some cadets, even with the best written explanations. Without additional general group guidance and any desired individual guidance, the current system may be subject to misinterpretation.

11. The high intercorrelations between the four area Predicted QPA's (PQPA's), coupled with such characteristics as the usual tendency of "true" scores to be closer to the mean on the criterion variable than are "predicted scores", complicates practical interpretation and use of the differences between current area PQPA's.

D. CONCLUSIONS.

1. The results may be used by cadets, but only as a guide, since their decision on area of concentration should include any other relevant considerations that are important to them and to their goals in life.

2. For some cadets, these measures currently will not provide significant discrimination between the areas they are seriously considering.

3. Although application to the Class of 1979 data available near the end of their seventh term indicates exceptionally high overall validity, some of the components involved in the compatibility scores need to be refined and sharpened up. Research efforts to improve the techniques for computing and using the scores should accompany the validation research when the final Class of 1979 criterion data are available. (This class took the SCII in September 1978).

4. At each step in the implementation of this program every possible effort should be made to identify and counteract the inherent dangers in such a system, such as a tendency for some to be overly dependent on it, lack of complete accuracy in the measures, insufficient discrimination, and cadets becoming confused by the many complications, and considerations.

E. RECOMMENDATIONS.

1. Administer the SCII test to the Class of 1981; compute the special area scores; and, prior to selection of an area of concentration, give these cadets a simplified computer-produced summary similar to Chart 2.

2. Provide the Company Academic Counselors with a more refined form, using a computer-produced format along the lines of that shown in Chart 1.

3. Prior to the report, provide the Company Academic Counselors with written and oral explanations of the basis, meaning, interpretation, and use of the results, with instructions by the Office of the Dean.

4. Obtain feedback from the cadets to assist in refining the system.

5. Evaluate the system over the next ten months to determine if it is in fact a useful counseling tool. Incorporate necessary changes to the system during the evaluation to account for changes in the characteristics of its criterion groups and improvements in the methodology.

6. Based on the results obtained from Recommendation 5, decide on whether or not to continue the system with the Class of 1982, by October 1979.

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APPENDIXES (Cont.)

THE DEVELOPMENT OF GUIDANCE MATERIALS
FOR
CADETS IN THE SELECTION OF THEIR
AREA OF CONCENTRATION

A. PURPOSE

1. Near the middle of their fourth term at USMA cadets are required to select an area of concentration for their remaining academic work, primarily from one of four areas: Basic Science, Applied Science, Humanities, and National Security and Public Affairs. Cadets currently choose their area of concentration without the benefit of objective quantifications of their predicted level of success in area of concentration courses or of their possible personal satisfaction in each area.

2. On 2 June 1978, The Dean of the Academic Board requested that the Office of Institutional Research utilize the data available on the Class of 1978 to develop techniques for providing objective guidance measures to the cadets in their selection of an area of concentration. It was further requested that the measures consider cadet potential for compatibility with successful performance in each of the four areas of concentration. This report presents current results of the response to the Dean's request.

3. In this research program, compatibility is defined as similarity between a cadet's pattern (profile) of relevant characteristics and the unique pattern of measurable characteristics that best distinguishes cadets successful in one area of concentration from cadets in other areas.

B. METHODOLOGY

1. General

a. Data available on computer tape records for the cadets in the Class of 1978 were screened to select the objective data elements which were judged to be most likely to help discriminate among successful cadets in the four areas of concentration. Initial variables thus identified included measures of academic success in high school (5 variables) and during early terms at USMA (28 courses), admission variables (CEER/ACEER), measures of values (ROKEACH Value Survey: 36 Value Scales) and of interests (Strong-Campbell Interest Inventory: 176 Interest Scales). The Strong-Campbell Interest Inventory (SCII) and the Rokeach Value Survey had been selected previously (because of their preeminence as practical, researched, and psychometrically sophisticated measures of an individual's patterns in various types of interest and values), and given to the Class of 1978 in connection with two other research projects. For both tests extensive comparative data are available to enhance interpretation of the results.

b. The two criteria of success used in this study were (1) cadet compatibility of interests and value patterns with these patterns of cadets with area QPA's in the top half for their area of concentration, and (2) area of concentration Quality Point Average (area QPA).

c. A group of 64 "trial" variables (computed composite scores) were developed from the 262 original exploratory variables as potential predictors of success in an area of concentration. Two types of computed scores - one to predict the cadet's compatibility with an area of concentration and the other to predict the cadet's area of concentration QPA - were developed from the original variables as follows:

(1) For each of the 262 original variables previously mentioned, the statistical significance was determined (F-tests and t-tests) for the difference between the means of the following groups: (a) cadets in each area of concentration versus those in all the other areas combined; (b) cadets in the top half versus those in the bottom half of a given area of concentration; (c) a composite of all cadets in the top half of their area versus a composite of all those in the bottom half of their area of concentration; (d) cadets in one of the two physical science areas (Basic and Applied combined) versus those in one of the non-physical science areas (NSPA and Humanities combined). In addition, two sets of correlations were computed for each initial variable, one set with membership/nonmembership in each area (point biserial correlations) and the other set with area QPA (regular product-moment correlations). The statistical significance of each of the 524 correlation coefficients was produced also by the SPSS computer program.

(2) The original variables with high statistical significance (usually $p < .001$) as predictors of group membership or of area QPA were selected for inclusion in one of the 64 preliminary scales. (APPENDIXES I through IV identify these variables and present relevant statistics.) Using a unique approach, each selected variable's correlation with the criterion was converted to an equal-unit interval scale and the resulting "weight" was given the sign of the correlation coefficient. (The correlation to weight transformation table is given in Appendix VII.) For each cadet, his original score on that initial variable was multiplied by this weight, and the products for each type of variable added to produce the 64 computed trial scores for each cadet. Thus a set of four area-of-concentration group membership computed scores and four area QPA computed scores were produced from each of the eight types of potential predictor measures. These measures included Strong-Campbell Interest Inventory, Rokeach Value Survey, High School academic performance, Admissions Tests (one from CEER component tests and one from ACEER tests) and early USMA performance (from 28 course grades and nine averages for departmental groups of courses).

d. In brief, three types of scores have been developed for the guidance of cadets:

--scores to measure a cadet's compatibility with cadets successful (above average) in each area.

--scores to predict a cadet's QPA in each area.

--composite score combining the other two types.

2. Cadet Compatibility with Areas of Concentration

a. Area Compatibility Raw Scores. Three sets of raw scores were developed as predictors of cadet compatibility with each of the four areas of concentration:

--general interest scores
--occupational interest scores
--Rokeach value scores

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(1) **General Interest Based Compatibility Raw Scores**. General interest scores (GI raw scores) were computed from the cadet's scores on these regular Strong-Campbell Interest Inventory (SCII) Scales that reflect his responses to the questions on six Themes (such as Realistic, Investigative, Social) and in 23 Basic Interest (BI) scales (such as Military Activities, Mathematics, Nature). They also included the SCII scales for "Academic Orientation", "Occupational Introversion", and for tendency to give "like", "undecided-indifferent," or "dislike" responses to seven types of questions (as on occupations, activities, school subjects, or types of people). For example, the Applied Science Area General Interest raw score (AS GI RSC) is the sum of the cadet's score multiplied by the equal-unit transformation (as shown in Appendix VII) of the correlations shown in Appendix I.*

(2) **Occupational Interest Based Compatibility Raw Scores**. These sets of "OI" raw scores were similarly computed by weighting the scores made by each cadet on the selected scales from the 124 Strong Campbell Interest Inventory occupational scales. (The selected scales and correlations are shown in Appendix II.)

(3) **Rokeach Value Based Compatibility Raw Scores**. The four area "RV" raw scores were developed from the cadet's scores for each of the Rokeach Values identified in Appendix III, in the same way as were the area compatibility interest scores as described above.

b. Area Compatibility Standard Scores. The three sets of raw compatibility scores for each area were converted to a standard score with a mean of 50 and standard deviation of 10 for all cadets in the sample who graduated in the top half of their area of concentration. (Cadets who graduated in the top half of all cadets in the given area of concentration are defined as "successful"). The magnitude of each cadet's scores in the three measurement areas (general interest, occupation interest and Rokeach value scores) reflect the similarity of that cadet's values and interests compared to cadets of the Class of 1978 who were successful (top half) in a given area of concentration.

c. Discriminant Analysis. In order to investigate the effectiveness of using the three standardized scores to classify cadets into areas of concentration, a discriminant analysis was performed. If cadets were reassigned to the four areas of concentration by chance alone, on the average about 25% normally would be correctly assigned. The discriminant analysis correctly assigned 50% of the cadets in the four highhalf Area QPA groups when Rokeach value-based area standard were used, 69% when only the four area General Interest Scores were used, and 65% when only the four Occupational Interest Scores were used. For both the Applied Science and NSPA areas 80% were correctly assigned by both sets of

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*Specifically, AS GI Raw Score = 10 (Mechanical Activities BI Score) + 09 (Mathematics BI Score) + 08 (Realistic Theme Score + Science BI Score) + 06 (Introversion Special Scale) + 05 (Investigative Theme Score) + 04 (Conventional Theme Score) + 02 (Characteristics "?" Response % Score) -02 (Characteristics "Yes" Response % Score) -03 (Social Theme Score + Teaching BI Score + Right Preference Response % Score) -04 (Artistic Theme Score + Music/Dramatics BI Score) -05 (Social Service BI Score) -06 (Writing BI Score + Public Speaking BI Score + Law/Politics BI Score).

scores from SCII. The four area Rokeach Value set correctly classified 50% of the Applied Science group and 72% of the NSPA group (see Appendix VIII which explains the results of the discriminant analysis).

d. Regression Analysis. The collective effectiveness of the twelve area compatibility scores (in correctly matching cadets with their area of concentration) was checked further by developing multiple regression equations. Each such equation determines and uses the weighted pattern on an optimal selection from the twelve area compatibility standard scores to predict being in a given area, versus all other areas combined, at graduation. The multiple correlations produced are point-biserial correlations, with maximums possible ranging from .20 to .80, depending on the preparation of the total group that is in the area involved. Hence, they were corrected to a comparable 1.00 maximum by dividing the obtained r by the corresponding maximum possible point-biserial r for that area. The multiple regression equations were also applied to the Class of 1979 to check their cross validities.

Regression equations with membership in an area as the dependent variable and only the three compatibility standard scores for that area as independent variables were not used as they could not be as effective in discriminating between the more similar areas (area "A" vs. area "B" or area "N" vs. area "H") as could the significantly discriminating patterns from all twelve area compatibility scores. For example, some of the humanities compatibility scores aided markedly in discriminating cadets in the Applied Sciences and Engineering Area from those in the Basic Sciences area.

It was judged desirable to provide the cadet with a less complex basis for interpreting the twelve compatibility scores and their combinations into a general indiation of _this_ overall relationship between his compatibilities and the four areas of concentration. Hence the four Rokeach Value based compatibility standard scores (RVSS's) were ranked from high to low; the four area GISS's were similarly ranked; and the four area OISS's likewise. The three resulting ranks for each area were averaged and the three corresponding area compatibility standard scores were averaged also (see Chart 1).

The four areas were then ranked in terms of their mean ranks (ties between areas were broken by the ranks of the corresponding standard score means). Thus, each of the twelve compatibility scores were given equal weight in identifying the area in which a cadet's pattern of values and interests is most discriminatingly like the patterns of successful cadets at graduation. The ranks of these four area means were used to develop Section 1 of the simplified summary report to cadets (see Chart 2).

3. Predicted Area of Concentration Quality Point Average (Area PQPA)

a. Area PQPA Raw Scores. Using the equal-interval scale technique mentioned previously, for weighting in terms of correlations with the criterion, four sets of raw scores were developed for each cadet as independent predictors of his 4-year area quality point average if he were to select one of the possible areas of concentration:

--a combination of general interest and occupational interest scores
--early academic performance at USMA
--Rokeach Value Survey Score
--High school rank

4

(1) <u>General Interest - Occupational Interest Scores.</u> When QPA in an area was used as the criterion, these two types of scores (see paragraph 2 above for description) were combined (averaged). The correlations between the two for a given area were too high for both to contribute effectively in a regression equation, even though they represent different kinds of interest scales (see Appendix I and Appendix IX).

(2) <u>Early Academic Performance at USMA.</u> A measure of future academic success at USMA for each cadet was developed based on his grades in courses regularly completed as of the end of first term, third class year: mathematics, physical sciences, foreign languages, English, social sciences and history. In most departments cadets may be assigned to, or select, different courses (as in English, Mathematics, Foreign Languages, and History), hence the cadet's departmental averages on the courses taken were used.

(a) Raw scores for academic performance in each area of concentration were computed by assigning weights, using the equal-interval transformation shown in Appendix VII, to grades received based on the correlation of the grades with area of concentration grade point average.

(b) Using the weights thus determined, a similar equation was developed to predict the quality point average of each cadet in each of the four areas of concentration from his early USMA academic success (see Appendix IV).

(3) <u>Rokeach Value Scores.</u> These were developed in a manner similar to that for computation of raw scores described in paragraph 2a (3), but using QPA in an area as the criterion. (See Appendix III for the values significantly related to area QPA and Appendix IX for inter correlations of area value scores.)

(4) <u>High School Rank Score.</u> A standardized score of high school rank (computed for each cadet while a candidate for USMA) was included since previous research indicated that performance in high school correlates well with final class standing at graduation from West Point. Appendix V summarizes the data for the pre-USMA performance variables, including some not used at this time because they were readily available for only a relatively few cadets.

b. Area PQPA Regression Equations.

(1) The General/Occupational Interest Scores, Academic Performance Scores, Rokeach Value Scores, and High School Rank Scores were combined into four regression equations that yielded the most accurate prediction of quality point average for each of the four areas of concentration.

(2) For each cadet, the four regression equations were used to compute a predicted QPA for each of the areas of concentration. Thus, each cadet can be given both an expected Area QPA and a standard score that can be readily interpreted in terms of area percentiles based either on all cadets graduating in the given area in 1978 or only on those with the same PQPA. These will permit direct comparisons of level of performance in the future with predicted performance. (Table 6 shows Predicted QPA's, multiplied by 100, and percentiles for each area).

(3) To reduce a tendency to treat the predicted QPA's as having perfect precision and to insure that random errors of estimate (prediction errors), are considered by cadets, confidence bands were computed for

each of the QPA predicted standard scores. The probable error of estimate was computed for each of the scores to provide the basic confidence band. For the predicted score, the predicted score plus one probable error of estimate, and the predicted score minus one probable error of estimate the expected percentile rank equivalents (among all cadets graduating in that area) were computed for use by the academic counselors to help guide the cadet. (See Appendix VI B to VI E for the basic data, Table 6 for generalized statistics, and charts 1 and 2 for example reports to cadets and to academic counselors.)

(4) Comparison of Earned QPA With Predicted QPA*. For each area of concentration, four graphs were produced depicting the correlation between actual area QPA and the four predicted area QPA standard scores. These graphs show the observed distribution of differences between actual QPA and predicted QPA for cadets of the Class of 1978 (see Table 6). The correlations between Area QPA and Predicted Area QPA and their probable errors of estimate, in QPA points, were as follows:

Applied Sciences and Engineering $r=.860$, $PE_{EST} =.187$
Basic Sciences, $r=.933$, $PE_{EST} =.118$
National Security and Public Affairs, $r=.866$, $PE_{EST} =.178$
Humanities, $r=.916$, $PE_{EST} = .116$

4. Composite Measures of Similarity Between Each Cadet and Cadets Graduating in Each Area of Concentration.

One of the two types of standard scores previously discussed, (the Compatibility Scores) reflects the extent to which a cadet's patterns on significantly discriminating general and occupational interests and the significant components of his value system are similar to those of above average cadets in each area. The other type (predicted Area QPA's) provides him with predictions of his level of success in each of the areas if he performs in the future as he has in the past. Where the higher scores on the three compatibility scales and PQPA scale all tend to be in the same area, the cadet should have no problem integrating these with any other considerations that he might consider important in light of his individual goals. However, when the four higher scores do not tend to be predominantly in the same area, the cadet's task becomes more complex.

The major decision for many cadets seems likely to be whether to go into one of the Physical Science areas, or into one of the other areas. The patterns of intercorrelations between the typical interests, values, and special cognitive abilities of cadets, their entry into discriminant functions (see Appendix VIII), and related research on curricular dimensions at other colleges (Biglan, 1973; Kuhn 1962; Smart, et al, 1977), all suggest that the major dimension, or factor, distinguishing between the four areas of concentration may appropriately be called a Physical Science-Non Physical Science dimension, with NS PA and Humanities at the opposite end of the scale from the Applied Science and Basic Science areas*. Membership in the two area groups was used as the criterion

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*Comparisons of area PQPA's with each other are included in the sections on Reliability of Differences.

*A definitely secondary dimension seems to be "Pure Science" - "Applied Science", with Humanities and Basic Science areas at one end and Applied Science and NSPA areas at the other, but this dimension (factor) was less distinct and accounted for a relatively small portion of the variance.

variable, a regression equation developed, and raw scores converted into scaled scores. A low score indicates similarity to cadets in the A/B areas, a high score indicates similarity to cadets in the N/H areas, and a score of about 50 indicates lack of an overall composite tendency toward either group of areas.

This score is a statistical combination of the compatibility and area PQPA scores into a composite total score that optimizes each component's weight to maximally represent the degree of similarity between the cadet's patterns of relevant characteristics and the patterns of these characteristics of cadets who graduate in the two criterion groups (A/B or N/H areas). Multiple regression equations accomplished this purpose. They combine the cadets sets of twelve compatibility scores (area values and interest standard scores) and predicted area QPA standard scores, with each weighted in such a way as to predict similarity with cadets graduating in the A/B versus the N/H areas with maximum accuracy possible from these variables.

This composite score is particularly important initially, as the number of cases remaining in the Humanities and Basic Science Areas had shrunk so much that little confidence could be felt in the results if they were used for guidance purposes in these two areas until they were cross validated. Fortunately, the regular profile provided commercially for the SCII contains much of the additional guidance information likely to be needed by cadets seriously considering selection of either the Basic Sciences or Humanities area.

The distribution statistics on all the final standard scores were computed for the cadets in each of the four area groups and for those in each Area QPA upperhalf/lowerhalf sub groups. These are given in Appendix VI.

5. Reliability of Scores and of Differences.

a. Reliability Coefficients. Reliability coefficients for the 36 individual values and for the various interest scales are given respectively in the manuals for the Rokeach Values Survey (Rokeach 1973) and for the Strong-Campbell Interest Inventory (Campbell, 1977). The reliability of term-end grades earned in typical USMA academic courses in 1968-1971 have been previously reported to be .54 (Bridges 1974). The reliabilities reported for the scales used from each type of test were sufficiently homogeneous that the median reported reliability coefficient and the number of interest, or value, scales could be used in the Spearman-Brown Formula (Downie, 1977, p.257) to obtain useful estimates of the reliabilities of the final sets of seventeen scores reported for cadets. Since each of the individual scales, that were combined to compute the area scores from the two standardized tests, already had useful reliability as reported in their manuals, their combination into computed USMA scores yields very accurate measures as shown in Table 1.

b. Probable Error of Measurement of Score. When interpreting an obtained score a useful measure of its accuracy is the band obtained by adding to it and subtracting from it the Probable Error of Measurement for that scale as shown in Table 1 ($PE_{Meas} = .6745\ SD\ \sqrt{1-r_{xx}}$). This band identifies the range within which an individual's "true" score on the measure can be expected to fall 50% of the time, below which 25% and above which 25%. In other words, one can be reasonably confident that an individual's "true" score falls within this band, but there is one chance in four that the cadet's true ability is below this band and

one chance in four that it is above this band. For higher confidence, doubling the PE_{Meas} yields a band expected to include the true score more than nine times in eleven, the true score being above the band less than one time in eleven (p=.0885). PE_{Meas} multiplied by 2.439 can be used to obtain the 90% band, with only 1 chance in 20 of true score being higher. The use of such bands for reporting scores is widely preferred because it emphasizes the point that no measure or prediction is absolutely precise and because it meaningfully depicts the level of accuracy when interpreting a specific score.

c. The Reliability of Differences Between Two Scores. For a difference between scores on two scales, there are two influences on the magnitude of its reliability: errors due to the unreliability of the two scales and the correlation between the two scales. When two scores have a correlation of zero, the amount of overlap between the probable error of measurement bands for the two, as discussed above, can provide an accurate indication of the amount of confidence that the cadet's true scores differ. If the two confidence bands <u>for uncorrelated scales</u> overlap more than 50%, the corresponding true measures on the two scales are more likely to be the same than to be different. However most of the measures have at least a low correlation. The higher the correlation between the two measures involved, the greater the overlap in the two bands can be (i.e., the less the difference between the two scores) and still represent true differences between the two abilities of the cadet.

A special statistical technique was developed to combine the data on both the reliability of and the correlation between the two scales being compared and to indicate the general tendency of differences between scores to represent differences between true scores, or conversely, to indicate the extent to which the obtained differences between the two scores reflects only the errors of measurement for the two scales.

Such statistics are the percent of the variance in the obtained distribution of differences that is due to the errors of measurement, and its converse, the percent of the differences-variance that is due to differences between "true" scores on the two scales. As shown in Table 2, this statistic provides a meaningful indication of the general differential power of the predicted QPA's for the four areas of concentration.

Since the reliability coefficient, r_{xx}, is the proportion of the total variance that is true variance (Dubois, p.390), knowing the percent of the observed differences variance that is due to unreliability permits* direct calculation of the reliability coefficients and the probable errors of the differences (Bridges 1979).

To provide counselors with a more precise basis for interpreting the practical meaningfulness of observed differences between two PQPA scales in each of the six possible pairings, the probable error of each pair of differences was computed and is reported in Table 2.

6. Validity of the Scores.

The extent to which the scores reported to cadets reflect what they were designed to measure in the developmental sample from the Class of 1978 and the extent to which findings are generalizable to other groups is evidenced in three ways:

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*$r_{xx} = 1 - (SD^2 error/SD^2_x)$

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--the characteristics of the method by which they were
  constructed
--their relationships with the criteria in the Class of
  1978
--their relationships with the preliminary criteria when
  computed for the Class of 1979

(a) Characteristics of the Construction Method. Each of 64
preliminary scores were developed by a significant refinement of the
method that Dr. Strong, Dr. Campbell and other researchers have so
repeatedly in the last 50 years shown can yield scales that are unique
in their success in validly discriminating between criterion groups. To
interpret the refinements necessary in this research, it is necessary to
have a general idea of the usual method. It identifies the individual
items for which responses by individuals in the two groups characteristically
differ markedly. The responses to these items are weighted in accordance
to the way their responses differ correspondingly (now usually + 1, 0,
or -1) and the weights added to obtain a raw score scale. This is
converted to a standard score scale, usually one with a mean of 50 and a
standard deviation of 10 in the significant criterion groups. The very
low reliability usual for individual items requires large groups (prefer-
ably more than 300 individuals in the criterion group and many more in
the reference group), forty to fifty discriminating items, and differences
of 18% or more in the keyed responses of the criterion group and the
reference group. Campbell states, "...scales of this length have good
test-retest reliabilities, and items showing this difference...provide
valid scales that are unusually resistant to cross-validation shrinkage;
that is when applied to new samples, their ability to discriminate
persists." (Campbell, 1977, p. 50.)

The 64 preliminary scales (32 area of concentration membership
scales and 32 area of concentration QPA scales) were developed by using
regular test scores yielded by the test author's scoring procedure (each
of which have acceptable reliability) instead of from one small group of
individual items. Their unique weighting in terms of their validity and
addition into one raw score avoids the multi-colinearity problem and
reduced reliability when multiple regression techniques were used directly
on the individual test scales, USMA course grades, or high school perform-
ances. Thus useful validity and reliability both are expected with
even a relatively small number of scales and individuals. In fact the
major reason for dropping those preliminary scales eliminated (some were
combined for reasons of parsimony and colinearity) was because of current
lack of ready availability for all cadets rather than lack of validity.
(This was especially true of average high school grades in the major
high school departments, and of CEER and ACEER components.) There seems
to be clear evidence on construct validity.

(b) The Relationship of the Scores with the Criteria in the
Class of 1978. Only complete data cases were used in the successive
developmental analyses, so the initial 733 cadets had shrunk to 171
cases for the final developmental sample. In the developmental samples
the magnitude and significance of the correlations and with the criteria
(see Table 5) and of the differences between distributions of scores for
the relevant groups (see Appendix 6A-6Q) provide clear evidence on the
concurrent validity of each of the scales. When requisite data were
available so that the scores could be computed for a much greater number
in the Class of 1978, minor shrinkage in the correlations with the
criteria provides additional suggestions of the persistence of the
validity in other groups.

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(c) The Relationships Between the Scores and the Preliminary
Criteria When Computed for the Class of 1979. The equations developed
on samples from the Class of 1978 for the 17 scores used in the area of
concentration guidance program were applied to the cadets in the Class
of 1979. Most of them had taken the Strong-Campbell Interest Inventory
in 1978 and the Rokeach Values Survey in 1977 (both during reorganization
week for other research projects). In computing their preliminary area
QPA's, only those grades on record in December 1978 could be used.
However, their final grades in 1978-79 could hardly produce significant
changes in the correlations between area Predicted QPA scores and earned
Area QPA's. These correlations of the area scores with the criteria are
shown in Table 7, accompanied by discussion of their implications.

C. RESULTS AND DISCUSSION

The development of the materials for this educational guidance
program involved so many steps and intricate evaluations that some key
findings were incorporated with the above detailed sequential presentation
of the procedure in order to facilitate efficient communication and
understanding of the methodology and results. The basic supporting
statistical details are presented in the appendixes.

Those statistical results and considerations considered to be most
crucial to understanding and using the materials for this program are
presented in the following tables and charts and their accompanying
discussions.

1. Reliability of Area Scores.

Every measurement can be considered as consisting of two components,
due to errors of measurement. The other component is the "true" measure
component.

The smaller the proportion of the obtained measures that is solely
due to errors of measurement, the higher the proportion solely reflecting
the "true" measure.

Hence, the reliability is sometimes refused to as precision, or
accuracy and consistency or reproducibility. Both high reliability and
high validity are required for high dependability. The reliability of a
test, scale or other instrument is defined as that portion of the total
obtained variance of the scores that is due to, or results from, variance
in the "true" scores on the characteristic being measured for the group
being measured. Reliability of a test or scale is most commonly measured
by some version of self-correlation (self-consistency) of scores from
two administrations of the test or scale. Reliability of an individual
score is commonly indicated by the number of score units from (above
or below) the obtained score that one can be confident (at a specified
level) will include the "true" score. Score precision can be indicated
by the standard error of measurement, or its mathematical function, the
probable error of measurement. Reliability correlation coefficients for
different scales, tests, or instruments are directly comparable. A
probable error of measurement statistic is applicable only to the instrument
on which it was developed.

Table 1 summarizes data related to the accuracy or stability of the
seventeen scores reported to cadets. The reliability coefficients are
Spearman-Brown Formula estimates of test-retest correlation coefficients,

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based on the median reliability coefficient of the components scales (as reported in the test manuals) and on the number of components. That these are useful estimates of correlations that would be obtained if the tests were given twice without extraneous effects was indicated by comparing the reliability coefficients yielded by this formula with those produced by more sophisticated techniques that require data not available for the component scales (Werts, et al, 1978).

Normally it is desirable that such reproducibility (reliability) coefficients be above .90 for measures who results are to be used in making decisions on individuals. The scores reported to cadets all seem to meet this standard.

A more meaningful statistic, when interpreting the precision of a cadet's score, is the Probable Error of Measurement also shown in Table 1. If a test could be given an infinite number of times to the same cadet without extraneous effects, his mean score would be considered his "true" score and the probable deviation* of their distribution would be the Probable Error of Measurement. A cadet's "true" score would be within one PE_{Meas} of his obtained score 50% of the time. The chances are 90 in 100 that his obtained score is not more than 2.439 PE_{Meas} from his "true" score. There are about 5 chances in 100 that his "true" score is more than 2.439 PE_{Meas} above his obtained compatibility standard score or predicted Area QPA.

2. Reliability of Differences Between Two Area Predicted QPA's.

Table 2 summarizes the data related to the magnitude of difference between two predicted area QPA's for a cadet that is necessary before one can have confidence that the difference accurately represents the difference between his two corresponding "true" PQPA scores (as defined in previous section). As is usual for test score differences, the reliability coefficients themselves for the differences certainly are not very high. This makes even more important the use of the Probable Error of Measurement of the differences when comparing two predicted Area QPA's. As a rule of thumb, when the difference is less than the Probable Error of Measurement of the difference scores, no confidence can be held that they reflect true differences in the cadet's probable success if he were to chose either area. When the difference between two area PQPA's is greater than the PE_{Meas}, there is less than 1 chance in 4 that the direction of the "true" differences would be reversed. If the differences in PQPA's for any two areas is greater than the figure shown within parentheses for that pair of area PQPA's, then there are less than five chances in 100 that the cadet would earn a higher area QPA in the area with the lower PQPA, unless of course he significantly changes in interests, values, motivations, or work-study habits. Thus if a cadet's NPQPA is higher than his BPQPA by 0.06 points, there is less than 1 chance in 4 that he would earn a higher area QPA in the Basic Sciences Area. When this difference is greater than 0.14, there is less than 1 chance in 20 of a reversal.

Table 2 also shows the number of cadets and the means for all the cadets in the Class of 1978 with data on record for all components of the given area PQPA as an aid in understanding and explaining the differences between the probable success indications for a cadet. It also emphasizes the care that must be excercised when explaining the differences in success relative to other cadets in the given areas, (as

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*PD = 0.67449 times SD

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reflected by <u>area</u> standard scores and by the corresponding <u>area</u> percentile ranks) versus differences between area QPA's themselves. Briefly, the means of the predicted raw scores indicate that if all cadets in the class had entered any one of the areas, their expected mean area QPA's would differ relatively little. However, the standard scores (SS) for a given area are scaled so that <u>all cadets actually in an area</u> will have a mean SS of 50 and a standard deviation of 10, and can be directly converted to corresponding area percentiles. Thus a theoretical "typical", or average cadet, one representative of the entire class, would do much better <u>relative to others in the same</u> area, if he were to choose NSPA. He would be poorest, relative to others in the same area, if he were to choose the Basic Sciences Area.

3. Reliability of the Differences Between Two Area Compatibility Standard Scores.

Table 3 presents data related to the confidence that can be held in the significance of obtained differences between two Area Compatibility Standard Scores of the same type. These data and their interpretation are similar to those discussed above for differences between Predicted Area QPA. Thus, if a cadet's compatibility standard score derived from the SCII General Interest Scales for the NSPA area (NGISS) is more than 1.61 standard score points higher than his comprable score for the Basic Sciences Area (BGISS), there is one chance in four that it is higher due solely to errors in the measurements of the General Interest scales involved in these two area compatibility standard scores. In other words, some confidence can be held that this cadet's pattern on area discriminating General Interests is more similar to the mean pattern of graduating in the top half of the NSPA area than it is like the patterns of above average cadets in the Basic Sciences area of concentration. Doubling this 1.61 PE_{Meas} of differences gives 3.22 standard score points. When a cadet's NGISS is 3.22 <u>greater</u> than his BGISS, there is less than once chance in eleven* that his NGISS "true" score is equal to or less than his BGISS "true" score.

4. Correlates and Validity of the Area Predicted QPA's.

Tables 4 and 5 present data related to interpreting the construct and concurrent validity of the four predicted area QPA's. All these correlations are based upon the total group in the Class of 1978 with data on the pair of variables involved, not upon the samples used in developing the score equations. (When rounded to hundredths, the correlations involving predicted QPA standard scores--PQPASS's--are identical with the comparable correlations involving predicted QPA's-- i.e. PQPA "raw scores.")

(a) Correlates of APQPA's.

The underscored correlations in the left section of Table 4 indicate that each of the PQPA's has an exceptionally high correlation with its corresponding earned area QPA. Inspection of the four columns shows that the best predictor of each area QPA is its corresponding PQPA, the underscored correlation. Interestingly enough, both the APQPASS and the NPQPASS uniquely have a slightly higher correlation with the earned

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*More precisely, p < 0.0885, one-tailed test.

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Basic Sciences QPA (BQPA) than they did with their own area QPA's. Since the PQPA score development groups for both the Basic Sciences and the Humanities areas were quite small, lower reliability for these two groups per se does not seem to be the direct cause. Further sharpening of the equations in the future may throw some light on this point.

The original Physical Science Standard Score (PHYSCSS) was developed solely to optimize differentiation between graduation in the A/B versus the N/H areas. The correlation of scores on this scale with each of the four area QPA's was positive, but it would be considered a good predictor only of AQPA and BQPA. On the reports to cadets, in general, the further a cadet's arrow is toward the left, i.e. toward the extreme A/B end of the composite score scale, the higher the expected area QPA at graduation. However, this does not seem to hold true for QPA's expected in the NSPA and the Humanities areas.

The middle section of Table 4 provides a meaningful demonstration of the general soundness of the corrections used for the point-biserial correlation (i.e. the two-group membership correlation) by the maximum point-biserial correlation normally possible for two groups containing the observed proportion of the sample involved. In general the corrected correlations, those shown within parenthesis, are in the same general order as the corresponding regular linear correlations with QPA, as shown in the left-hand section.

The correlations given in the right-hand section of Table 4 indicate that in general, for the Class of 1978, the expected level of success on an area's specific courses (i.e. the area PQPA) is only a moderately good predictor that a cadet in this class entered and graduated in the given area. It is hoped that the guidance program for which these materials were developed will help improve this situation for the Class of 1981 and for subsequent classes.

(b) Area QPA's versus Area Predicted QPA's.

Table 5 shows the actual area QPA's earned by cadets in that area with a given area predicted QPA (area PQPA). Note that the QPA's and PQPA's were both multiplied by 100 for computer processing. Merely move this decimal point two places to the left to convert it to the USMA scale. (These four graphs were produced by the SPSS computer statistical package.) The five lines drawn on each represent the mathematically smoothed general linear trend based on the data for the group in that area. The heavy central line is the regression line, indicating the mean area QPA earned by cadets with a given PQPA. Half of the cadets normally would be expected to earn an area QPA above it; half below it.

The dash lines indicate the trends for the PQPA plus one probable error of estimate and for the PQPA minus one probable error of estimate. Normally, 50% of a class would be expected to fall between these two dash lines, about half of these (25% of total) should fall between the upper dotted line and the solid line (i.e. in the "level 3 hi" band).

The upper of the two lighter solid lines indicates the trends for 2.439 multiplied by the PE_{est} and added to the PQPA; the lower indicates the trend for 2.439 multiplied by the PE_{est} and subtracted from the PQPA. As shown on the table, normally 5% of a class would be expected to earn an actual area QPA in level 1, (above the top light line) and another 5% in level 5, (below the bottom light line). Successively

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cummulating the percentages from the top down, yields the percentage probabilities reported on Chart 1--probability that a cadet with a given area PQPA will actually earn an area QPA surpassing that corresponding to the lower limits for the successive levels. For example, if a cadet has an APQPA of 2.622, there are about 5 chances in 100 that his earned AQPA at graduation would be 3.075 or more (in level 1); 25 chances in 100 that it will exceed 2.808, 50 chances in 100 that it will exceed 2.622 and 75 chances in 100 that it will exceed 2.436. Finally, there are 95 chances in 100 that it will exceed 2.169 (level 4 or higher). Hence, there are five chances in 100 that his AQPA at graduation will be in level 5. The magnitude and direction of the departure of a cadet's earned area QPA at graduation from his area PQPA represents the magnitude both (1) of grade relevant motivations and other characteristics that currently are not adequately represented in this area PQPA equation and (2) of errors of measurement included in QPA and in PQPA.

The lines on Table 3 show the general trends of PQPA levels and bands reported on the two computer print-outs for each cadet (see Charts 1 and 2). Table 3 also shows the percentage of cadets in their area with an area QPA at graduation that did not exceed selected values, i.e. the four area percentile ranks. The close similarity of the PQPA's data for the Class of 1978 and the preliminary data for the Class of 1979 indicates that these tables based on the Class of 1978 data continue to be appropriate.

5. Correlations of the Area Compatibility Scores with the Criterion in the Developmental Sample.

Table 6 presents data on the concurrent validity in the group on which the scales were developed for the twelve area compatibility scales. The multiple correlation between an optimal combination of selected compatibility scales and being in the given area is shown at the right end of the raw for each area of concentration.

(Note: In a multiple regression correlation, several independent factors (in this case the twelve compatibility scores) are weighted statistically in terms of their combined importance as a mean of explaining the differences in the dependent variable (in this case graduation in the given area of concentration versus in any of the other areas of concentration.) When these equations were applied to the total Class of 1978 and to the Class of 1979 for which requisite data were available, the corrected multiple correlations were as follows:

	Cl'78	Cl'79
Applied Science	.71	.68
Basic Science	.68	.34
NSPE	.67	.65
Humanities	.64	.31

The magnitudes of the underscored correlations indicate that most of these compatibility scores are considered to have a good co-relationship with being in the corresponding area of concentration. For example, nine of these twelve are within, or above, the usual range of correlations found for both public school pupils and college student's between their mental ability test scores and their average academic marks.

Even with normally expected shrinkage when the Class of 1978 equations are used to develop area compatibility scores for other classes, an individual compatibility score should have adequate validity

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to provide useful guidance. Furthermore, a cadet's pattern on all twelve compatability scores should retain excellent validity as a guide in identifying the area(s) of concentration with which his profile of interests and values are most similar and the area(s) with which his profile is least similar. In general the relatively lower ones of the correlations for the area compatibility scores are judged to result largely from the smaller number of value scores selected for inclusion and their lower reliability coefficients or from the very small number in two of the area developmental groups. Data on other and larger samples should throw more light on the validity of all of the compatibility scores.

6. The Validity and Cross-Validity of 17 Scores to be Reported to Cadets.

The concurrent validity of the seventeen scoring equations developed on a sample from the Class of 1978 is indicated by their application to all of the cadets in the Class of 1978. In general, the validity of all of them in measuring what they were designed to measure is clearly demonstrated by the data from the scores to the cadets in the Class of 1979. These data are summarized in Table 7. Clearly, in most cases there has been an unusually small shrinkage in the validity coefficients.

7. Evaluation of the Proposed Guidance Program.

The validity of the scores themselves has been demonstrated on two classes. Although both validity and cross-validity were exceptionally high, possibilities for refinements and improvements were indicated. In their present form the scores clearly identify, with a high degree of accuracy, the area(s) of academic concentration in which a cadet is likely to be most satisfied and successful. Thus, one might say that the quality of the contents has been evaluated, but the packaging, delivery and consumption remains to be evaluated. Specifically, the effectiveness with which the scores are reported to cadets and of the guidance program accompanying them warrant evaluation. It may be found that somewhat more extensive preparation of the cadets in the use of the scores and in the decision making process itself, or more access to a professionally trained guidance counselor (individually or in groups) or additional preparation of the company academy counselors in the interpretation and use of the scores will be found desirable to obtain such possible outcomes of the program as the following:

--A larger proportion of the graduating class highly satisfied with their choice, and a smaller proportion dissatisfied.

--A reduction in the proportion of the class that seeks to change their initially chosen area of concentration.

--A larger proportion of the graduating class that ranks their area first when asked to rank the areas in the order of the extent to which they would find them personally satisfying.

--A reduction in the proportion of the cadets in each area with very low compatibility scores.

--An increase in the average compatibility score and predicted area QPA in each area.

--A significant shift toward positive skewness and perhaps leptokurtos (peakedness) in the shape of the distributions of final area QPA's, predicted QPA's, and compatibility scores.

--Increased general satisfaction with relevant important specifics in the USMA academic program.

--Reduction in the proportion of the cadets in each area of concentration whose area QPA is significantly below that predicted (sometimes called "under achievement").

--Increase in the proportion of cadets whose area QPA is significantly above that predicted.

D. CONCLUSIONS

1. The results may be used by cadets, but only as a guide, since their decision on area of concentration should include any other relevant considerations that are important to them and to their goals in life.

2. For some cadets, these measures currently will not provide significant discrimination between the areas they are seriously considering.

3. Although application to the Class of 1979 data available near the end of their seventh term indicates exceptionally high overall cross validity, some of the components involved in the compatibility scores need to be refined and sharpened up. Research efforts to improve the techniques for computing and using the scores should accompany the validation research when the final Class of 1979 criterion data are available. (This class took the SCII in September 1978.)

4. At each step in the implementation of this program every possible effort should be made to identify and counteract the inherent dangers in such a system, such as a tendency for some to be overly dependent on it, lack of complete accuracy in the measures, insufficient discrimination, and cadets becoming confused by the many complications, and considerations.

5. The sustained cross validity of the program for the areas in which the scoring equations were developed on small samples suggests it may be possible to develop a similar program for guidance in choice of field of study.

E. RECOMMENDATIONS

1. Administer the SCII test to the Class of 1981; compute the special area scores; and, prior to selection of an area of concentration, give these cadets a simplified computer-produced summary similar to Chart 2.

2. Provide the Company Academic Counselors a more refined form, using a computer-produced format along the lines of that shown in Chart 1.

3. Prior to giving the Company Academic Counselors the cadet's reports (Chart 1), provide the counselors with written and oral explanations of the basis, meaning, interpretation, and use of the results, with instructions by the Office of the Dean.

4. Obtain feedback from the cadets to assist in refining the system.

5. Evaluate the system over the next ten months to determine if it is in fact a useful counseling tool. Incorporate necessary changes to

the system during the evaluation to account for changes in the character-
istics of its criterion groups and improvements in the methodology.

6. Based on the results obtained from Recommendation 5, decide on
whether or not to continue the system with the Class of 1982, by October
1979.

Table 1

Reliability of Area Compatibility, Success and Over-All Composite Standard Scores

	Reliability Coefficient*	Probable Error of Measurement**	Standard Deviation for Class
AREA COMPATIBILITY STANDARD SCORE			
From General Interest Scales			
AGISS	.99	0.91	13.54
BGISS	.98	1.15	12.08
MGISS	.99	0.83	12.28
BGISS	.99	0.88	13.10
From Occupational Interest Scales			
AOISS	.99	0.99	14.68
BOISS	.99	0.98	14.47
NOISS	.99	0.82	12.10
HOISS	.99	0.82	12.20
From Rokeach Value Scales			
ARVSS	.94	1.73	10.49
BRVSS	.95	1.69	11.18
NRVSS	.94	1.61	9.73
HRVSS	.94	1.81	10.93
AREA PREDICTED OPA's			
APOPA	.98	.056	.5852
BPOPA	.96	.062	.4595
NPOPA	.99	.033	.4906
HPOPA	.97	.042	.3615
COMPOSITE A/B - N/H SS	.99	0.89	13.21

* Computed by Spearman - Brown Formula

** $PE_{Meas} = .6745$ times SD for Class times $\sqrt{1 - \text{reliability coefficient}}$

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Table 2

Intercorrelations and Reliability of Differences Between Area Predicted QPA's

(The intercorrelations are above the diagonal and reliability coefficients* are below the diagonal of section A)

Section A	APQPA	BPQPA	NPQPA	HPQPA
APQPASS		.969	.928	.866
BPQPASS	.00		.946	.883
NPQPASS	.67	.64		.955
HPQPASS	.80	.80	.65	
N	308	459	329	313
Mean SS	44.94	43.31	54.27	44.32
SD SS	12.76	10.20	10.62	9.16
Mean Raw Sc.	2.903	3.126	2.931	3.073
SDR Sc.	.585	.459	.491	.361

(The standard deviations of differences in Area PQPA Raw Score are above the diagonal and the Probable Error of Measurements of Differences (& difference for 9/10 confidence) are below the diagonal of Section B)

Section B

	APQPA	BPQPA	NPQPA	HPQPA
APQPA		.174	.187	.248
BPQPA	.12 (.28)		.140	.227
NPQPA	.07 (.18)	.06 (.14)		.193
HPQPA	.07 (.18)	.07 (.18)	.05 (.11)	

*The proportion of the variance in the differences between cadet's pair of obtained scores ($SD^2$1-2) that is due to variance in differences between cadet's "true" scores on the measures (SD^2 True Diff.). (Bridges 1979.)

Table 3

Intercorrelations and Reliability of Differences Between Area Compatibility Standard Scores

Above Diagonals Are The Intercorrelations Between Cadets Four Area Compatibility Standard Scores For The Three Types—General Interests, Occupational Interests, and Rokeach Values (and SD of Difference Score Distributions).

Below Diagonals are Reliability Coefficients for Differences (and Probable Error of Differences).

General Interest Scales

	AGISS (.99*)	BGISS (.98)	NGISS (.99)	HGISS (.99)
A·SS		.75 (9.16)	-.89 (25.10)	-.89 (25.90)
B·SS	.94** (1.51)		-.92 (23.86)	-.49 (21.74)
N·SS	.99 (1.69)	.99 (1.61)		.66 (10.49)
H·SS	.99 (1.75)	.99 (1.47)	.97 (1.24)	
N	639	632	639	706
Mean	37.77	35.34	43.14	36.42
SD	13.54	12.08	12.28	13.10

Occupational Interest Scales

	AOISS (.99)	BOISS (.99)	NOISS (.99)	HOISS (.99)
A·SS		.90 (6.52)	-.96 (26.52)	-.92 (26.35)
B·SS	.90 (1.39)		-.98 (26.44)	-.71 (24.68)
N·SS	.99 (1.79)	.99 (1.78)		.79 (7.87)
H·SS	.99 (1.78)	.99 (1.66)	.95 (1.19)	
N	563	582	565	604
Mean	36.58	33.75	43.26	40.33
SD	14.69	14.47	12.10	12.20

Rokeach Value Scales

	ARVSS (.94)	BRVSS (.95)	NRVSS (.94)	HRVSS (.94)
A·SS		-.04 (15.63)	-.78 (19.08)	-.47 (18.37)
B·SS	.95 (2.36)		-.40 (17.51)	-.09 (16.32)
N·SS	.97 (2.23)	.98 (1.67)		.35 (11.82)
H·SS	.96 (2.48)	.97 (1.91)	.91 (2.39)	
N	589	589	589	589
Mean	44.83	38.63	47.98	42.77
SD	10.49	11.18	9.73	10.93

* Reliability coefficient of scores from Spearman-Brown formula.

** Reliability coefficient of score differences = ratio of true difference variance to total difference variance = $(\bar{r}_{xx} - r_{12})/(1-r_{12})$.

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Table 4

Some Correlates of Area Predicted QPA's

Standard Score	Correlation of Area Predicted QPA's With Area QPA at Graduation				Point Biserial Correlation of Area PQPA's With Graduating in High Half-Low Half on Area QPA (Corrected Estimate of r)				Point Biserial Correlation of Area PQPA's With Graduating in Each Given Area Vice Other Areas Combined. (Corrected Estimate of r)			
	AQPA	BQPA	NQPA	HQPA	A (Hi-Lo)	B (Hi-Lo)	N (Hi-Lo)	H (Hi-Lo)	DUMMY A-BNH	DUMMY B-ANH	DUMMY N-ABH	DUMMY H-ABN
APQPASS	.86	.93	.79	.78	.65 (.81)	.78 (.97)	.65 (.81)	.60 (.76)	.31 (.40)	.30 (.52)	-.51 (-.66)	.03 (.04)
BPQPASS	.85	.93	.79	.83	.63 (.79)	.78 (.97)	.62 (.78)	.71 (.90)	.27 (.35)	.23 (.40)	-.44 (-.57)	.06 (.10)
NPQPASS	.74	.88	.87	.87	.55 (.69)	.76 (.95)	.69 (.87)	.71 (.89)	.13 (.17)	.21 (.36)	-.37 (-.47)	.18 (.29)
HPQPASS	.67	.82	.82	.92	.46 (.57)	.72 (.90)	.66 (.83)	.75 (.95)	.03 (.04)	.21 (.36)	-.31 (-.40)	.23 (.38)
PHYSCSS	.66	.60	.21	.18	.53 (.66)	.34 (.42)	.10 (.13)	.03 (-.03)	.54 (.70)	.26 (.46)	-.58 (-.74)	-.14 (-.23)
Number Cadets	97to156	34to51	124to196	33to56	229	78	333	93	229	78	333	93
					Proportion in Area				Number in Area			
Proportion in High ½	.4978	.5000	.5015	.5161					.3124	.1064	.4543	.1269
Proportion in Low ½	.5022	.5000	.4985	.4839					Proportion in Other Areas			
									.6876	.8936	.5457	.8731
Maximum Possible rpt. bis.	.80	.80	.80	.80	.80	.80	.80	.79				
Max rpt.bis					.77	.58	.785	.615

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TABLE 5. Distribution of Four Area QPA's Earned in Class of 1978 by Cadets with Each Area Predicted QPA (PQPA) for the Given Area. Total Area Percentile Ranks Corresponding to Selected Earned Area QPA's, and Relevant Statistics. (All QPA Data Have Been Multiplied by 100.)

APPLIED SCIENCE AND ENGINEERING PREDICTED QPA
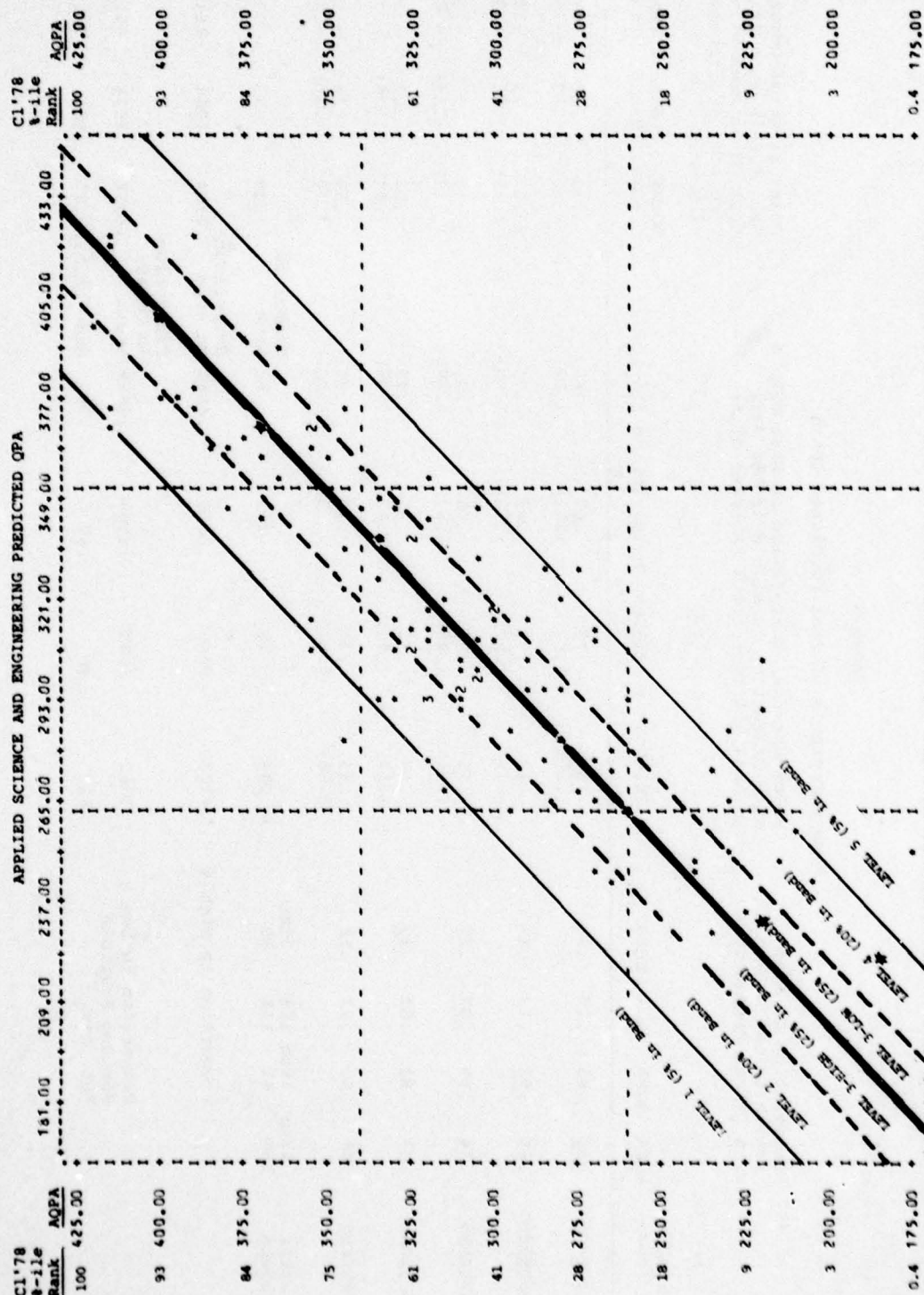
STATISTICS: Correlation (r)=0.8626 Probable Error of Estimate = 18.58 AQPA = 1.01927 AQPA -6.70273 No. Plotted Values =115
Mean AQPA = 313.5 SD AQPA = 45.68 TOTAL AREA GROUP: No. = 229 Mean AQPA = 310.2 SD AQPA = 58.80

TABLE 5 (Cont.)
Basic Sciences Area Predicted QPA (BPQPA)

CL'78
%-ile   "B"
Rank   QPA

100   419.00

86   400.00

75   381.00

55   362.00

48   343.00

32   324.00

18   305.00

9   286.00

5   267.00

4   248.00

1   229.00

CL'78
%-ile   "B"
Rank   QPA

100   419.00

86   400.00

75   381.00

55   362.00

48   343.00

32   324.00

18   305.00

9   286.00

5   267.00

4   248.00

1   229.00

437.00 413.00 389.00 365.00 341.00 317.00 293.00 269.00 245.00 221.00

209.00 233.00 257.00 281.00 305.00 329.00 353.00 377.00 401.00 425.00 449.00
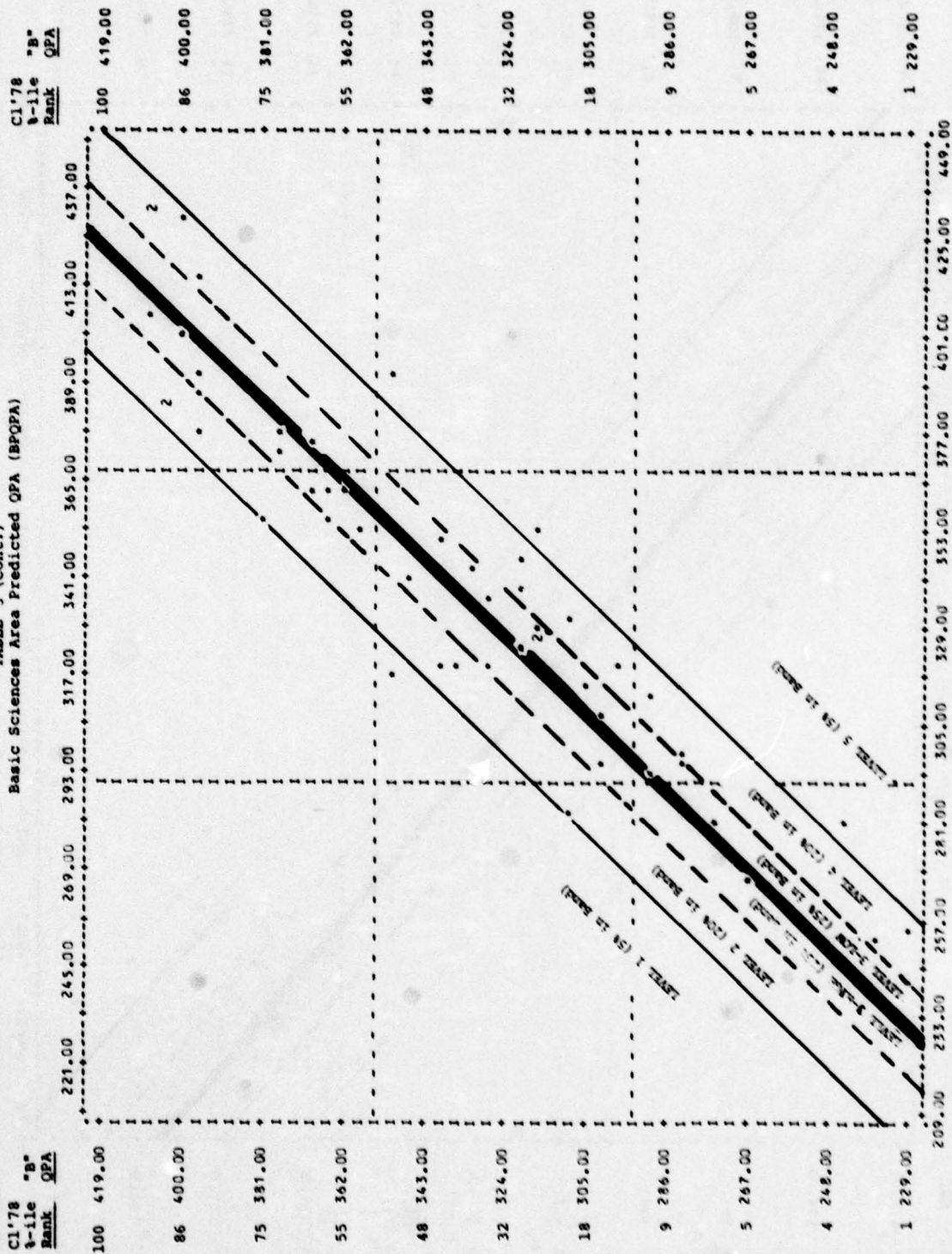
STATISTICS: Correlation: (r)=0.9322   Probable Error of Estimate = 11.82   Plotted Values = 51   BQPA = 0.99113   BPQPA -0.09809
Mean BQPA = 342.8   SD BQPA = 45.11   TOTAL AREA GROUP: No. = 78   Mean BQPA = 347.7   SD BQPA = 44.44

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TABLE 5 (Cont.)

National Security and Public Affairs Area Predicted QPA (NPQPA)
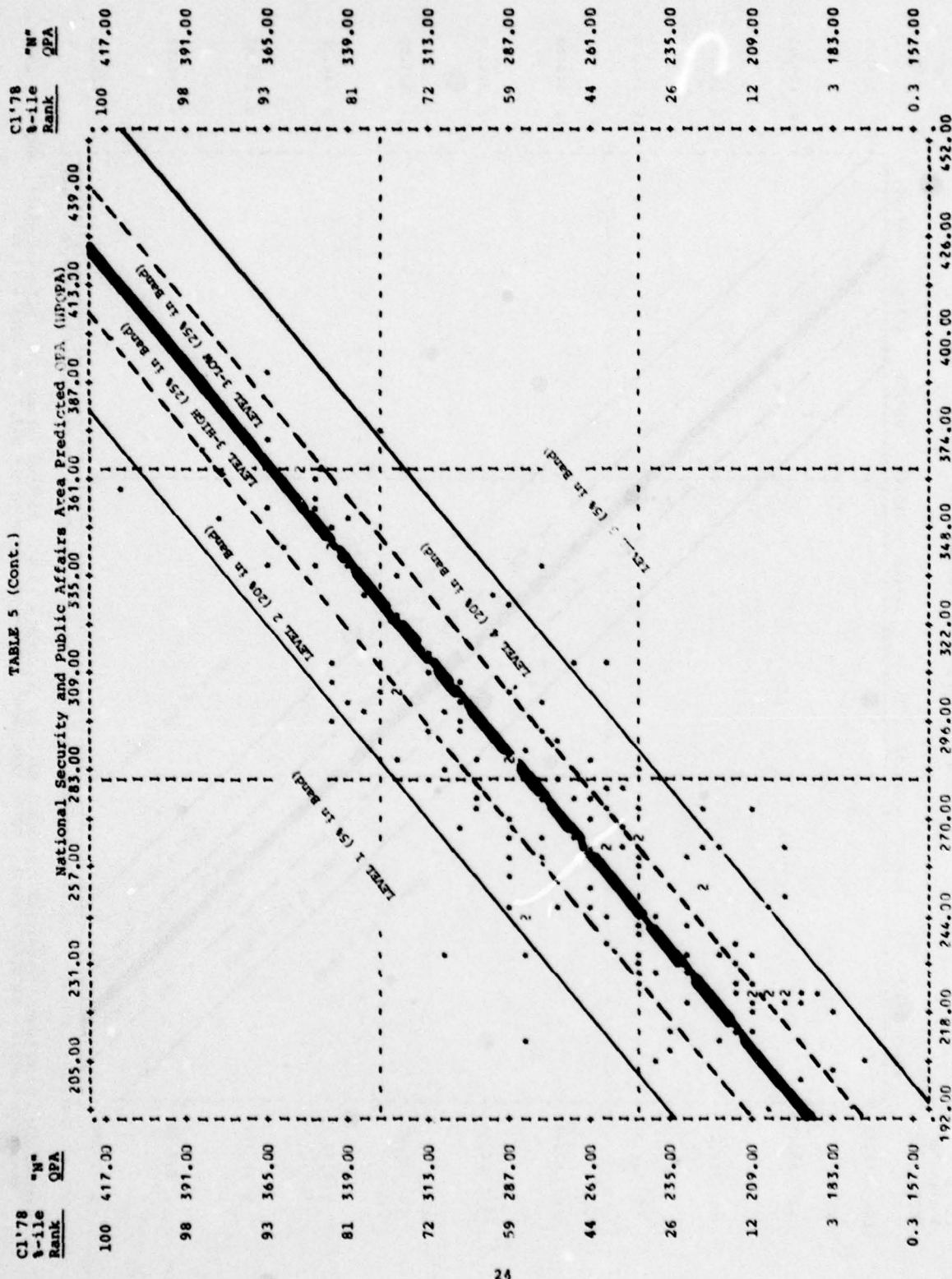
STATISTICS: Correlation (r)=0.8678 Probable Error of Estimate = 17.72 NQPA = 17.72 NPQPA = 0.98896 NPQPA +3.17268 No. Plotted Values =
149 Mean NQPA = 273.29 SD NQPA = 46.24 TOTAL AREA GROUP: No. = 333 Mean NQPA = 278.0 SD NQPA = 57.55

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Humanities Area Predicted QPA (HPQPA)

TABLE 5 (Cont.)

LEVEL 5 (5% In Band)
LEVEL 4 (20% In Band)
LEVEL 3-LOW (25% In Band)
LEVEL 2 (20% In Band)
LEVEL 1 (5% In Band)

Cl'78 %-ile Rank	"H" QPA
100	403.00
93	382.00
77	361.00
65	340.00
46	319.00
32	298.00
20	277.00
9	256.00
2	235.00
1	214.00
1	193.00
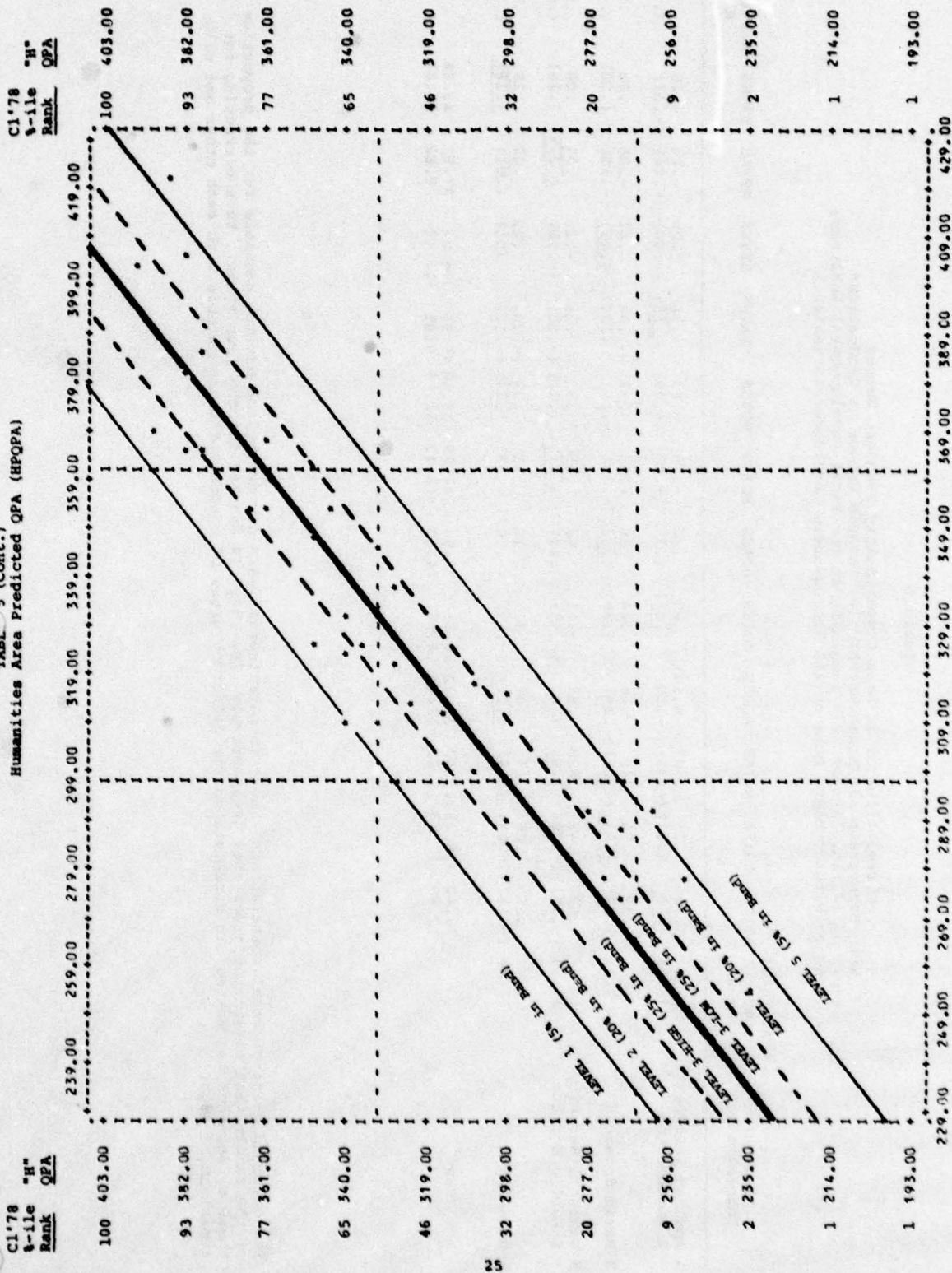
STATISTICS: Correlation $(r)=0.9136$ Probable Error of Estimate = 12.00   HQPA = 0.98626 HPQPA +5.48230   No. Plotted Values = 37

Mean HQPA = 329.70   SD HQPA = 39.39   TOTAL AREA GROUP: No. = 93   Mean HQPA = 321.5   SD HQPA = 44.49

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Table 6

Correlations of 12 Area Compatibility Standard Scores
With Membership (1)/Nonmembership (0) in Area Groups at Graduation*
(N=Sample of 171 in Class of 1978 remaining in the Final Developmental Analyses,
Hence With Complete Data on All Successively Considered Variables.)

Area of Concentration	% of Total[1] Sample In Area	AGISS	BGISS	NGISS	HGISS	AOISS	BOISS	NOISS	HOISS	ARVSS	BRVSS	NRVSS	HRVSS	Multiple R
A Applied Sciences & Engineering	36.8%	.63 (.49)	.28 (.22)	-.503 (-.39)	-.64 (-.50)	.63 (.49)	.47 (.37)	-.55 (-.43)	-.63 (-.49)	.36 (.28)	-.00 (-.00)	-.26 (-.20)	-.40 (-.31)	.81 (.63)
B Basic Sciences	9.4%	.38 (.22)	.58 (.33)	-.49 (-.28)	-.26 (-.15)	.44 (.25)	.56 (.32)	-.53 (-.30)	-.32 (-.18)	.04 (.02)	.51 (.29)	-.26 (-.15)	.05 (.03)	.81 (.46)
N National Security & Public Affairs	41.5%	-.63 (-.50)	.62 (.49)	.51 (.40)	-.63 (-.50)	-.62 (-.48)	.65 (.51)	.53 (.42)	-.25 (-.20)	-.23 (-.18)	.34 (.27)	.20 (.16)	.20 (.16)	.80 (.63)
H Humanities	12.3%	.26 (-.16)	.06 (-.04)	.15 (.09)	.42 (.26)	.31 (-.19)	.16 (-.10)	.21 (.13)	.39 (.24)	.39 (-.12)	.02 (.01)	.02 (.01)	.29 (.18)	.63 (.39)
Mean		38.42	36.25	41.80	35.92	38.21	35.56	41.79	39.60	45.95	38.07	47.57	42.26	
SD		12.62	11.10	11.22	12.44	14.98	14.53	12.42	12.64	9.89	11.14	9.82	11.00	

*The obtained point-biserial correlations (shown in parenthesis) were divided by the maximum possible for the proportion of the sample that was in the given area (respectively .78, .57, .79 and .62 for the four areas), thus correcting for these differences and making the correlations for different areas of concentration comparable with each other and with a maximum of 1.00.

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Table 7

The Validity and Cross Validity of the Seventeen Scores

Correlations Between Each Set of Scores and Their Criterion
For All Cadets Having Data on the Corresponding Pair of Variables
In the Total Class of 1978 (Maximum N = 733) and in the Class of 1979
(Maximum N = 741). For the Dichotomus Dummy Variables, the Obtained
Point Biserial Correlations Have Been Corrected to Same Base.

SCORES	Total Class of 1978			Class of 1979		
	N	$r$pt. bis.	r.	N	$r$pt. bis.	r.
COMPOSITE A/B-N/H	255	(.674)	.853	307	(.652)	.826
PREDICTED AREA QPA's						
APQPA	115	(–)	.800	187	(–)	.823
BPQPA	51	(–)	.933	31	(–)	.922
NPQPA	149	(–)	.866	161	(–)	.884
HPQPA	37	(–)	.916	24	(–)	.862
AREA COMPATIBILITY STANDARD SCORES SIMILARITY OF GENERAL INTERESTS						
AGISS	639	(.5274)	.685	688	(.4792)	.614
BGISS	632	(.3744)	.646	656	(.1298)	.282
NGISS	639	(.5256)	.528	658	(.4675)	.592
HGISS	706	(.3038)	.494	755	(.1832)	.331
SIMILARITY OF OCCUPATIONAL INTERESTS						
AOISS	563	(.4983)	.647	580	(.5633)	.722
BOISS	582	(.3182)	.549	588	(.1815)	.395–
NOISS	565	(.5050)	.643	587	(.5552)	.703
HOISS	604	(.2708)	.440	618	(.1534)	.279
SIMILARITY OF ROKEACH VALUES						
ARVSS	589	(.2505)	.325	559	(.0377)	.048
BRVSS	589	(.2581)	.445	559	(.0358)	.079
NRVSS	589	(.2177)	.277	559	(.1040)	.132
HRVSS	589	(.1718)	.279	559	(–.0043)	–.008

CHART 1 - SAMPLE REPORT TO ACADEMIC COUNSELORS

AREA OF CONCENTRATION SELECTION GUIDANCE REPORT TO CADET   WILLIAMS, JOSEPH K   819437   Co. B4

I. COMPATIBILITY SCALES

(SIMILARITY OF YOUR PATTERN TO THAT OF CADETS GRADUATING IN THE TOP HALF OF THEIR QPA DISTRIBUTION)

	SS*	RANK**
APPLIED SCIENCE AND ENGINEERING AREA(A)		
"A" GENERAL INTEREST SCALE	38	2
"A" OCCUPATIONAL INTEREST SCALE	43	1
"A" ROKEACH VALUE SCALE	57	1
("A" AREA MEANS)	(46.0)	(1.3)
BASIC SCIENCES AREA (B)		
"B" GENERAL INTEREST SCALE	36	3
"B" OCCUPATIONAL INTEREST SCALE	40	2.5
"B" ROKEACH VALUE SCALE	51	2
("B" AREA MEANS)	(42.3)	(2.5)
NATIONAL SECURITY AND PUBLIC AFFAIRS AREA (N)		
"N" GENERAL INTEREST SCALE	44	1
"N" OCCUPATIONAL INTEREST SCALE	40	2.5
"N" ROKEACH VALUE SCALE	34	4
("N" AREA MEANS)	(39.3)	(2.5)
HUMANITIES AREA (H)		
"H" GENERAL INTEREST SCALE	30	4
"H" OCCUPATIONAL INTEREST SCALE	31	4
"H" ROKEACH VALUE SCALE	49	3
("H" AREA MEANS)	(36.6)	(3.7)

II. PREDICTED AREA QPA(PQPA). BELOW ARE THE PROBABILITIES OF YOUR ATTAINING FIVE LEVELS OF QPA FOR EACH AREA, BASED ON YOUR PAST PERFORMANCE (YOUR PQPA IS THE 50% LEVEL.)

PROBABILITY OF ATTAINING AT LEAST QPA LEVEL SHOWN

AREA	95%	75%	50%	25%	5%
A	3.24	3.50	(3.69)	3.88	4.14
B	3.19	3.36	(3.48)	3.60	3.77
N	3.21	3.46	(3.64)	3.82	4.07
H	2.48	2.65	(2.77)	2.89	3.06

III. THE COMPOSITE OF YOUR COMPATIBILITY & SUCCESS SCALES PLACES YOU AS FOLLOWS ON THE B/A - H/N SCALES:

"B/A" Areas   EITHER   "H/N" Areas

VERY HIGH B/A	HIGH B/A	TYPICAL AREAS B/A	TYPICAL AREAS H/N	HIGH H/N	VERY HIGH H/N

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*SS = STANDARD SCORES. FOR CADETS GRADUATING IN THE TOP HALF OF THEIR AREA QPA'S: TWO-THIRDS FELL WITHIN THE 40-60 RANGE: VIRTUALLY ALL OF THEM HAD SS'S BETWEEN 30 and 70; THEIR MEAN WAS 50 AND STANDARD DEVIATION WAS 10.

**RANK AMONG THE FOUR AREA COMPATIBILITY STANDARD SCORES OF THE SAME TYPE.

CHART 2 - SAMPLE OF SUMMARY SHEET TO BE SENT TO CADETS

WILLIAMS, JOSEPH K   8119437   Co. B4

SECTION I: COMPATIBILITY (SIMILARITY OF INTERESTS & VALUES)

MOST   APPLIED SCIENCES AND ENGINEERING
2ND   BASIC SCIENCES
3RD   NATIONAL SECURITY AND PUBLIC AFFAIRS
LEAST   HUMANITIES

SECTION II: PREDICTED AREA QPA

| | R A N G E | |
	Probable Low	Probable High
APPLIED SCIENCES AND ENGINEERING	3.50	3.88
BASIC SCIENCES	3.36	3.60
NATIONAL SECURITY AND PUBLIC AFFAIRS	3.46	3.82
HUMANITIES	2.65	2.89

SECTION III: B/A AREAS GROUP VS N/H AREAS GROUP

THE COMPOSITE OF YOUR COMPATIBILITY & SUCCESS PLACES YOU AS FOLLOWS:

	"B/A" Areas		E I T H E R	"H/N" Areas		
VERY HIGH B/A	HIGH B/A	TYPICAL AREAS B/A		TYPICAL AREAS H/N	HIGH H/N	VERY HIGH H/N

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References

Biglan, A. "The Characteristics of Subject Matter in Different Academic Areas." Journal of Applied Psychology, 1973, 57, 195-203.

Bridges, C.F. Reliability of USMA Grades. OIR Research Report 75-001. West Point, 1974.

Bridges, C.F. "The Practical Significance of Differences Between an Individual's Scores on Two Measures." Research Memorandum. 10 January 1979.

Campbell, D.P. Manual for the Strong-Campbell Interest Inventory. Stanford: Stanford U. Press, 1977.

Downie, N.M. & Starry, A.R. Descriptive and Inferential Statistics. N.Y.: Harper and Row, 1977, 258-259.

Dubois, Philip H. An Introduction to Psychological Statistics. N.Y.: Harper and Row, 1965, 389-395.

Kuhn, T.S. The Structure of Scientific Revolutions. Chicago: University of Chicago Press, 1962.

Rokeach, Milton. The Nature of Human Values. N.Y.: Macmillan, The Free Press, 1973.

Smart, J.C., McLaughlin, G.W., and Montgomery, J.R. "The Reward Structures of Academic Disciplines." Office of Institutional Research, Virginia Polytechnic Institute, Blacksburg, 1977.

Werts, C.E., Rock, D.R., Linu, R.L., and Joreskog, K.J. "A General Method of Estimating the Reliability of a Composite." Educational and Psychological Measurement, 1978, 38, 933-938.

APPENDIXES

Data for the Strong Campbell Interest Inventory (SCII) Scores Used In Developing the Area General Interest Pattern Scales.

Selected data on the SCII Scales used to compute the four area similarity satisfaction standard scores (area GISS) and the four area specific QPA Raw Scores (area QGIRSC).

Abbreviations:

Area	Academic Area of Concentration.
A	Applied Science and Engineering Area.
B	Basic Science Area.
N	National Security and Public Affairs Area.
H	Humanities Area.
r pt. bis.	Correlation with area group membership. Point Biserial correlation coefficients, with cadets in the given area having a score of "1" and cadets in other areas a score of "0". An underestimate of the usual linear correlation coefficient. The maximums normally possible are about .78 for areas "A" and "N", and .60 for areas "B" and "H".
r Q	Usual linear correlation of variable with indicated area QPA; the Pearson product-moment coefficient.
SD	Standard deviation.
SE M	Standard error of mean, SD of means of random samples of same size from population.

Explanations:

(1) A positive correlation indicates that high scores on that interest scale are directly associated with high scores on the criterion (Group membership or QPA). A reported negative correlation indicates that low scores on that interest scale are significantly associated with high scores on the criterion.

(2) Correlations within parentheses were not included in developing the computed scores. They are reported only for completeness.

(3) Most of the correlation coefficients used, those not within parentheses, are significant at an alpha level better than .001 for the two areas with the largest number of cadets (area A & N). For the "B" and "H" areas r's with lower obtained significance levels are included in the computed score keys.

(4) The number of cases on which the statistics in a given column are based is indicated in parentheses under the heading.

APPENDIX I General Interest Scales

	Applied Science			Basic Science			NS & PA			Humanities			Total		
	Mean (218)	r pt. bis. (706)	r_Q (218)	Mean (76)	r pt. bis. (706)	r_Q (76)	Mean (206)	r pt. bis. (706)	r_Q (206)	Mean (88)	r pt. bis. (706)	r_Q (88)	Mean (706)	SD	SE_M
(Themes)															
Realistic	62.5	.37	(.02)	57.9	(.02)	(.02)	55.0	-.24	-.13	53.3	-.17	(-.01)	57.4	9.29	0.35
Investigative	55.1	.24	.19	58.2	.24	.35	48.9	-.30	.13	49.1	-.12	(.23)	51.8	9.08	0.34
Artistic	41.3	-.18	(-.04)	43.3	(-.03)	.23	44.9	(.07)	(-.03)	48.6	.16	.38	44.1	10.32	0.39
Social	48.6	-.15	(-.08)	47.6	-.11	(.02)	52.9	.18	(-.05)	52.1	(.04)	.24	50.9	10.35	0.39
Enterprising	51.0	(-.04)	(-.07)	47.6	-.15	-.21	53.2	.16	-.12	50.4	(-.05)	(.01)	51.6	9.42	0.35
Conventional	53.2	.16	.16	51.5	(.02)	.23	50.4	(-.07)	(-.00)	48.0	-.13	(.13)	51.1	9.10	0.34
("Realistic Content Areas")															
Agriculture	54.0			53.7		-.30	54.9	(.08)	-.08	52.8	(-.06)	(05)	54.2	8.71	0.33
Nature	46.0			47.4	(.07)		46.6	(.05)	(.03)	45.7		-.18	46.4	11.15	0.42
Adventure	62.8		-.14	60.9		-.28	62.8	(.05)	(.04)	60.9	(-.07)	-.15	62.3	7.48	0.28
Military															
Activities	64.5	(-.02)		62.9	(-.05)	(-.01)	64.8		(-.03)	63.7	-.17	.16	64.3	9.16	0.34
Mechanical	61.8	.46		57.3	(.09)	.19	50.9	-.38	-.14	50.1		(-.03)	54.6	10.31	0.39
("Investigative")															
Science	56.4	.36	.25	60.0	.31	.29	46.4	-.43	.11	47.3	-.14	-.18	51.0	10.03	0.38
Mathematics	59.6	.42	.29	60.2	.24	.35	48.7	-.42	(.04)	48.6	-.18	.16	53.3	10.06	0.38
Medical Science	51.1			55.0	.13	(.10)	50.9		(-.07)	49.5	(-.06)	(-.07)	51.2	10.21	0.38
Medical Service	48.4			49.6	(.07)	(.14)	47.6		-.20	46.8	(.06)	(-.10)	48.0	7.72	0.29
("Artistic")															
Music/Dramatics	42.0	-.16		43.6		.24	45.2	(.08)	(.00)	47.8	.13	.35	44.3	9.59	0.36
Art	40.1	(-.09)	(-.08)	40.7		.15	41.9		(-.03)	44.2	(.10)	.25	41.5	9.86	0.37
Writing	40.7	-.28		42.8		.28	46.8	.15	.26	51.6	.24	.46	45.1	10.33	0.39
("Social")															
Teaching	49.7	-.11	-.18	50.5		.15	52.1	(.08)	(.07)	52.8	(.06)	.20	51.2	9.24	0.35
Social Service	42.9	-.21	-.10	42.6	-.12		48.6	.23	(-.04)	45.6	(.06)	.16	46.0	9.96	0.38
Athletics	56.0			55.9	(-.11)	-.27	59.8	.18	-.31	55.5	-.14	-.22	58.3	7.62	0.29
Domestic Arts	44.3			43.5		(.12)	44.5		-.12	44.8			44.4	9.75	0.37
Religious Activities	47.1	(-.09)		48.3			49.6	(.07)	(-.05)	49.6		.43	48.7	11.01	0.41
("Enterprising")															
Public Speaking	51.1	-.26	(-.06)	50.2	-.17	(+.06)	57.9	.32	.12	55.6		.17	54.7	9.36	0.35
Law/Politics	49.9	-.28		46.7	-.15	(-.05)	57.4	.32	.19	55.1		.10	54.0	9.79	0.37

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APPENDIX I (Cont.)

	Applied Science			Basic Science			NS & PA			Humanities			Total		
	Mean (218)	rpt. bis. (706)	r_Q (218)	Mean (76)	rpt. bis. (706)	r_Q (76)	Mean (206)	rpt. bis. (706)	r_Q (206)	Mean (88)	rpt. bis. (706)	r_Q (88)	Mean (706)	SD	SE_M
Merchandising	47.2	(-.11)	-.10	43.8	-.18	-.16	50.9	.21	-.09	48.8			48.7	9.36	0.35
Sales	50.4	(-.04)	-.11	46.7	-.16	-.16	52.4	.15	-.14	50.4		(-.06)	50.9	8.96	0.34
Business Management	52.4	(-.07)		48.0	-.19	-.18	55.5	.18	(-.03)	53.4			53.5	10.13	0.38
("Conventional") Office Practices	45.2		.12	45.2		(.14)	45.4		-.09	44.6		.13	45.2	6.70	0.25
SPECIAL SCALES Academic Orientation	43.4		.20	50.8	.195	(.46)	40.4	-.19	.27	46.6	.09	.55	43.2	13.57	0.51
Introversion/ Extroversion	52.4	.27	.11	53.9	.19	(.00)	44.4	-.30	(-.04)	44.6	-.11	(-.17)	47.9	11.04	0.42
RESPONSE PERCENTAGE INDEXES "Like" School Subjects "L"	43.0		(.13)	44.4		.34	42.1		.14	42.5		.34	42.7	16.39	0.62
"Dislike" School Subjects "D"	29.9		(-.02)	27.9		-.32	29.6		(-.10)	26.3	(-.06)	-.28	29.1	16.78	0.64
"Dislike" Activities	26.2			31.8	.12	(-.10)	26.5		(.05)	24.7	(-.05)	(-.13)	26.7	14.70	0.56
Left Preferences "LP"	41.4			43.0	(.07)	(-.12)	40.5			39.7		-.26	40.9	10.51	0.40
"IP" Neither Preference	27.0			25.8		.31	26.2			27.3		(.20)	26.6	13.50	0.54
"RP" Right Preferences	33.7	-.11	-.09	33.7	-.06	(-.35)	36.9	.14	(-.05)	35.3	(-.07)	(-.07)	35.4	10.04	0.38
Characteristics "Yes"	55.8	-.07	-.14	54.2	-.07	(.06)	59.3	.10	(.06)	58.5	(.10)	(.10)	57.6	16.40	0.62
Characteristics "?"	26.8	.08	.13	25.1		(-.06)	23.9	-.09	-.10	25.7	(-.13)	(-.13)	25.2	13.57	0.54
Characteristics "No"	21.0		(.05)	25.6	(.11)	(.01)	21.4		(-.00)	20.1	(.01)	(.01)	21.5	12.62	0.50

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Data for the Strong Campbell Interest Inventory (SCII) Scores Used In Developing the Area Occupational Interest Pattern Scales.

Selected data on the SCII Occupational Interest Scales used to compute the four area similarity satisfaction standard scores (area OISS) and the four area specific QPA Raw Scores (area QOIRSC).

Explanations:

(1) A positive correlation indicates that high scores on that interest scale are directly associated with high scores on the criterion (group membership or QPA). A negative correlation indicates that low scores on that interest scale are significantly associated with high scores on the criterion.

(2) Correlations within parentheses were not included in developing the computed scores. They are reported only for completeness.

(3) Most of the correlation coefficients not within parentheses are significant at an alpha level better than .001 for the two areas with the largest number of cadets (areas A & N). For the "B" and "H" areas some r's with lower obtained significance levels are included in the computed score keys.

(4) The number of cases on which the statistics in a given column are based is indicated in parentheses under the heading.

Abbreviations:

Area	Academic Area of Concentration.
A	Applied Science and Engineering Area.
B	Basic Science Area.
N	National Security and Public Affairs Area.
H	Humanities Area.
$r_{pt. bis.}$	Correlation with area group membership. Point biserial correlation coefficients, with cadets in the given area having a score of "1" and cadets in other areas a score of "0". A minimal estimate of the usual linear correlation coefficient. The maximums normally are about .78 for areas "A & N", and about .60 for areas "B & H".
r_Q	Usual linear correlation of variable with indicated area QPA, a Pearson product-moment coefficient.
SD	Standard Deviation.
SE_M	Standard error of mean, SD of means of random samples of same size from population.

APPENDIX II

	Applied Science			Basic Science			NS & PA			Humanities			Total		
	Mean (218)	rpt. bis. (706)	r_Q (218)	Mean (76)	rpt. bis. (706)	r_Q (76)	Mean (206)	rpt. bis. (706)	r_Q (206)	Mean (88)	rpt. bis. (706)	r_Q (88)	Mean (706)	SD	SE_M
("Realistic" Occupations)															
Farmer-Male	32.0	.35	.02	27.3		-.31	22.9	(-.21)	-.27	18.8	(-.22)	-.38	25.7	11.9	.45
Instrument Assembler-Female	36.0	.34		34.3	(.12)	(-.16)	27.9	(-.24)	-.32	24.3	-.23	-.42	30.6	10.4	.39
Vocational AG Teacher-Male	26.9	(.24)		21.1	(-.14)	(-.21)	21.2		-.20	13.5	-.24	(-.18)	22.0	13.5	.51
Police Officer-Male	44.2	(.15)	(-.15)	37.2		(-.20)	42.2		-.22	38.0	-.13		41.8	11.0	.41
Highway Patrol officer-Male	45.2	.36		36.0		-.34	36.9	(-.14)	-.27	31.3	-.23	-.32	38.7	12.0	.45
Physical Education Teacher-Female	43.8	(.14)		40.2			41.9		-.35	35.3	-.20	-.44	41.5	11.4	.43
Skilled Crafts-Male	39.7	.51		33.6	(.12)	-.35	22.2	-.39	-.29	19.5	-.23	-.36	28.9	14.8	.56
Radiological Technician-Female	38.5	(.28)		40.3	.20		30.4	(-.26)	-.22	27.9	(-.19)	(-.15)	33.7	11.5	.43
Merchant Marine Officer-Male	48.3	.42		44.7			38.8	-.34		38.4	(-.16)	-.25	42.3	9.41	.35
Navy Officer-Male	49.3	.36	(.13)	44.3			38.7	(-.29)		38.8	(-.12)		42.6	12.4	.46
Veterinarian-Male	26.4	(.16)		31.5			20.7	(-.19)		18.5	(-.14)	-.15	23.4	13.0	.49
Coriographer-Male	49.5	.49	.16	46.9	.22	.27	33.1	-.44	-.11	32.2	-.20		39.5	13.6	.51
Air Force Officer-Male	44.6	.46	.17	39.8	(.11)	(.18)	30.7	-.38	-.11	30.0	(-.18)		35.9	12.7	.48
("Investigative")															
Engineer-Female	49.9	.49	.28	49.4	.24	.29	31.1	-.47		31.0	(-.20)		38.9	15.1	.57
Engineer-Male	48.0	.52	.21	45.2	.20	.27	30.4	-.49		30.1	(-.20)		37.4	13.8	.52
Chemist-Female	38.3	.40	.31	44.0	.32	.42	18.8	-.48		21.1	(-.15)	.26	27.9	17.4	.66
Physical Scientist-Male	26.1	(.30)	.28	33.7	.34	.42	12.8	-.44	.21	17.2		.23	19.8	14.3	.54
Medical Technician-Female	44.9	.42	.17	48.0	.30	(.24)	29.4	-.43	.28	27.8	(-.22)		36.0	14.1	.53
Pharmacist-Female	39.9	(.32)	(.15)	44.8	.30	(.15)	29.0	-.36		28.0	(-.18)		34.0	12.7	.47
Dentist-Female	38.3	.36	.16	40.4	.25		27.0	-.36		25.7	(-.19)		31.8	12.1	.46
Dental Hygienist-Female	31.1	(.19)		34.4	(.15)		29.0			25.9	(-.15)	-.36	29.9	10.2	.38
Physician-Male	31.5			37.1	(.25)	.26	24.0	(-.27)	-.27	24.2			27.8	12.8	.48

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APPENDIX II (Cont.)

	Applied Science			Basic Science			NS & PA			Humanities			Total		
	Mean (218)	r pt. bis. (706)	r_Q (218)	Mean (76)	r pt. bis. (706)	r_Q (76)	Mean (206)	r pt. bis. (706)	r_Q (206)	Mean (88)	r pt. bis. (706)	r_Q (88)	Mean (706)	SD	SE_M
Math or Science Teacher-Male	44.3	.43	.23	47.3	.30	.39	28.0	-.47		28.8	(-.17)		35.2	14.2	.53
Math or Science Teacher-Female	48.4	.47	.28	48.4	.24	(.24)	36.0	-.42		33.7	-.25		40.9	10.8	.40
Medical Technician-Male	31.0	(.31)	.21	36.5	.30	.34	18.3	-.36		17.3	(-.17)	(.24)	24.1	14.8	.56
Optometrist-Male	35.2	(.32)		37.1	.21	.26	24.5	-.31		22.8	(-.17)		28.9	13.2	.50
Computer Programmer-Female	47.0	.45	.25	48.4	.27	.29	30.0	-.45		29.5	-.20		37.2	14.6	.55
Computer Programmer-Male	45.3	.44	.26	46.5	.26	.41	28.2	-.46		28.5	(-.18)	(.19)	35.5	14.7	.55
Mathematician-Female	35.8	.34	.28	40.7	.32	.32	24.0	-.46	.29	27.1			29.9	11.8	.44
Mathematician-Male	23.4	.25	.27	30.2	(.34)	.40	18.9	-.42	.26	17.7	(-.16)	(.20)	19.1	11.3	.43
Physicist-Female	38.5	.48	.29	42.1	.31	.29	18.1	-.50	(.17)	20.1			27.4	16.8	.64
Biologist-Male	24.2	(.14)	.20	31.3	.29	.34	17.8	-.31	.20	21.8		(.26)	21.7	11.6	.44
Veterinarian-Female	37.7	(.26)	(-.13)	41.1	.25		30.0	-.30		29.5	(-.14)		33.5	10.6	.40
Optometrist-Female	43.7	(.32)	.17	45.1	.21		34.4	(-.29)		31.5	-.21	(-.21)	38.0	11.7	.44
Physician-Female	43.1	(.33)	.19	47.6	.30	.25	32.2	-.40	(.17)	32.9	(-.14)		37.3	11.7	.44
Social Scientist-Male	22.7	(-.16)	.16	29.8	(.15)	.46	24.6		.40	29.7	(.16)	.39	25.2	10.3	.39
Speech Pathologist-Female	42.8	(.21)	.22	47.0	.29	.38	38.0	-.37	.39	39.9		.34	40.2	8.2	.31
Speech Pathologist-Male	33.6	(-.15)	.16	39.4	.27	.35	30.3	(-.27)	.26	34.5		.26	32.8	8.6	.32
College Professor-Female	31.6			34.3		.25	34.3		.28	36.1		(.16)	33.9	9.1	.34
College Professor-Male	22.8	(-.33)	(.13)	25.5	(.19)	(.21)	33.0	(.25)	.02	35.6	(.18)	.27	29.4	13.2	.50
Psychologist-Female	28.3	(.12)		32.2	(.11)	.27	24.1	(-.22)	.34	26.0		(.14)	26.5	10.2	.39
Psychologist-Male	20.1	(-.14)		25.6		.40	22.3		.31	25.6		.28	22.4	10.4	.40
Language Interpreter-Female	26.1			29.9		.32	25.9	(-.12)	.44	31.6	(.18)	.28	27.1	9.5	.36

APPENDIX II (Cont.)

	Applied Science			Basic Science			NS & PA			Humanities			Total		
	Mean (218)	r.pt. bis. (706)	r_Q (218)	Mean (76)	r.pt. bis. (706)	r_Q (76)	Mean (206)	r.pt. bis. (706)	r_Q (206)	Mean (88)	r.pt. bis. (706)	r_Q (88)	Mean (706)	SD	SE_M
("Artistic")															
Architect-Male	20.9	(.27)		18.4	(-.15)		10.7	(-.28)		14.0			15.1	14.3	.54
Advertiser-Female	34.0	(-.21)		33.1		(-.17)	39.1	(.22)	.23	39.6	(.11)		37.0	9.1	.34
Art Teacher-Female	12.6			11.9		.27	12.9			16.2			12.8	13.5	.52
Photographer-Male	17.7	(-.16)	(-.12)	20.1			20.7		.20	24.9	(.23)		20.3	10.8	.41
Musician-Female	22.3	(-.16)		24.7			25.0			31.6	.23	(.23)	25.0	10.8	.41
Entertainer-Female	22.2	(-.21)	-.16	22.5			26.3	(.14)		29.1	(.17)		25.0	8.9	.33
Interior Decorator-Male	14.6	-.35	(-.13)	15.9	(-.13)		21.6	(.27)		23.5	.20		19.1	8.4	.32
Advertiser-Male	20.4	-.39	(-.13)	19.3	-.23		33.2	.37		34.5	(.19)	(.17)	27.9	12.9	.49
Language Teacher-Female	12.3	-.44		15.5	(-.15)	(.22)	26.7	(.28)	.31	34.4	.32	.44	22.1	14.8	.56
Librarian-Female	22.3	(-.20)	.17	26.3		.40	26.6		.47	33.2	.22	.62	26.1	12.4	.47
Librarian-Male	11.8	(-.27)		18.2		.54	16.9		.31	26.0	.30	.57	16.6	12.0	.46
Reporter-Female	25.6	(-.32)		26.4	(-.14)		33.6	(.24)	.31	37.2	.23	(.21)	30.8	10.7	.40
Reporter-Male	18.6	-.48		22.8	(-.14)		32.8	.35	.26	37.3	.28	(.24)	27.9	12.8	.48
English Teacher-Female	14.2	-.38		16.3	(-.15)	(.19)	26.4	(.26)	.28	32.3	.27	.42	22.4	14.2	.54
English Teacher-Male	20.5	-.41		23.0	(-.15)	(.20)	33.7	(.29)	(.16)	40.2	.29	.40	29.3	14.3	.54
("Social")															
Nurse L.P.N.-Male	24.4	(-.32)		27.0			30.3	(.26)	(-.24)	30.4	(.11)		28.2	7.8	.29
Social Worker-Female	18.2	(-.30)		18.3	(-.15)		30.1	.32	(.17)	28.6		.30	25.1	15.0	.57
Social Worker-Male	15.8	-.34		17.0	(-.15)	.28	27.9	.30	(.18)	29.4	(.16)	.37	23.2	14.6	.55
Priest-Male	18.5	-.37		22.9		.30	29.9	(.26)	(.13)	33.0	(.19)	.41	26.0	13.6	.51
Director Christian Education-Female	11.4	(-.23)		12.6			19.6	(.20)		20.3		.40	16.4	14.4	.54
YWCA Staff-Female	30.6	(-.26)	-.17	27.5	-.22		40.1	.34		37.2			35.5	12.6	.48
Minister-Male	19.7	(-.25)		21.8		(.20)	27.8	(.22)		28.4		.32	24.8	13.2	.50
Elementary School Teacher-Female	19.6	(-.13)		21.4		(.15)	22.8		(-.12)	22.7		.36	21.6	10.4	.39

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APPENDIX II (Cont.)

	Applied Science			Basic Science			NS & PA			Humanities			Total		
	Mean (218)	r pt. bis. (706)	r_Q (218)	Mean (76)	r pt. bis. (706)	r_Q (76)	Mean (206)	r pt. bis. (706)	r_Q (206)	Mean (88)	r pt. bis. (706)	r_Q (88)	Mean (706)	SD	SE_M
School															
Superintendent-Male	30.0	(-.20)		26.5	(.19)		38.2	.30		33.8		(.16)	33.9	13.2	.50
Recreation Leader-Female	30.7	(-.22)	(-.14)	27.7	-.20		38.4	.31	(-.09)	35.3			34.5	11.6	.43
Recreation Leader-Male	27.4	(-.21)	(-.12)	22.6	-.23		36.7	.34	(-.14)	32.1			31.8	13.6	.51
Guidance Counselor-Female	20.6	(-.28)		22.0	(.12)	(.15)	31.0	(.28)	(.20)	30.1		.28	26.8	14.4	.54
Social Science Teacher-Female	28.0	-.36		28.2	(-.18)		40.2	.37	.34	39.1		.29	35.0	12.9	.48
Social Science Teacher-Male	27.3	-.38	(-.13)	24.6	-.27		41.3	.46		37.7	.12		34.7	13.2	.49
Personnel Director-Male	33.1	(-.20)		29.7	-.20		41.0	.32		36.4			36.8	12.3	.46
("Enterprising")															
Department Store Manager-Male	29.7	(-.12)		24.4	-.21	-.29	35.4	(.28)	(-.15)	29.9		(-.18)	31.8	12.0	.45
Stewardess-Female	26.2	(-.16)		22.6	-.20	(-.17)	31.5	(.26)	(-.17)	29.0		(-.18)	28.6	10.4	.39
Chamber of Commerce Executive-Male	30.4	(-.25)		26.9	-.23		39.7	.33		37.5			35.2	12.5	.47
Sales Manager-Male	22.4	(-.20)	-.16	17.5	-.23	-.25	30.7	.33		26.0			26.2	12.7	.48
Life Insurance Salesperson-Male	23.6	(.23)	-.17	19.3	-.24	(-.22)	32.7	.37	(-.12)	27.5			27.8	12.1	.46
Life Insurance Salesperson-Female	27.3	(-.22)	(-.14)	23.6	-.22	(-.20)	35.6	.34	.43	31.6	(.12)		31.2	12.0	.45
Lawyer-Female	33.4	(-.29)		35.0			41.1	(.24)		41.7	(.12)	.32	38.1	11.4	.43
Lawyer-Male	22.3	-.46		25.2	(-.16)		36.9	.40	.34	37.6	(.18)	.32	31.2	13.1	.49
Investment Fund Manager-Male	27.3	(-.18)		27.2		(-.15)	32.6	(.20)	.25	32.2	(-.18)		30.3	11.0	.41
Pharmacist-Male	29.8			29.6			28.0		-.22	22.5			28.0	11.4	.43

APPENDIX II (Cont.)

Occupation	Applied Science Mean (218)	rpt. bis. (706)	r_Q (218)	Basic Science Mean (76)	rpt. bis. (706)	r_Q (76)	NS & PA Mean (206)	rpt. bis. (706)	r_Q (206)	Humanities Mean (88)	rpt. bis. (706)	r_Q (88)	Total Mean (706)	SD	SE_M
Buyer-Female	27.1	(-.13)		23.8	(-.14)	-.25	29.6	(.19)	(-.11)	25.0	(-.11)		27.6	9.5	.36
Buyer-Male	21.7		-.15	13.5	-.26	-.26	29.1	(.27)	(-.14)	24.2			24.6	14.6	.55
Funeral Director-Male	28.7	(-.13)		22.6	-.22	-.32	32.9	(.25)	-.29	27.2		-.26	29.7	11.4	.43
Realtor-Male	31.2		-.16	24.9	-.21	-.42	34.2	(.22)	(-.19)	28.3	(-.11)	-.30	31.5	11.0	.41
Agribusiness Manager-Male	25.4	(.18)		19.7		-.37	22.3		-.27	16.0	.20	-.35	22.2	11.5	.44
("Conventional")															
Banker-Male	27.9	(-.13)		24.7	(-.17)	-.28	33.6	(.28)		27.9		(-.16)	30.2	11.3	.42
Department Store Sales-Female	18.7	(.26)		17.0			19.8	(-.20)	-.27	18.1			19.0	8.0	.30
Accountant-Female	37.9		.24	35.9		(.20)	30.7		(.12)	29.2	(-.13)		33.3	12.0	.45
Secretary-Female	23.3	(-.20)	-.15	19.0	-.28	(.19)	28.6	(.31)	(-.19)	27.2			25.8	8.4	.32
Dental Assistant-Female	27.6	(.14)		26.8	(-.13)		25.4		-.32	22.3	(-.16)	(-.22)	25.8	8.2	.31
Beautician-Female	32.1		-.15	27.4		-.44	31.4		-.41	27.9	(-.12)	-.54	30.8	8.8	.33

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Data for Rokeach Value Scales

Selected data on the Rokeach Values (RV) used to compute the four area compatibility standard scores (area RVSS) and the four area specific QPA Standard Scores (area QRVSS).

Explanations:

(1) Since RV raw scores are from rankings, with "1" being highest in importance and "18" being lowest, for RV raw scores NEGATIVE correlation coefficients indicate that cadets in the area ($r$pt. bis.), or with high area QPA's (r_Q), tended to rank that value as higher in importance than did other cadets. Correspondingly, positive r's for RV scores reflect inverse relationships between the perceived importance of that value and the criterion.

(2) Correlations within parentheses were not included in developing the computed scores. They are reported only for completeness.

(3) Correlation coefficients not within parentheses are significant at an alpha level better than .01 for the two areas with the largest number of cadets (areas A & N). For the "B" and "H" areas some r's with lower obtained significance levels are included in the computed score keys.

(4) The number of cases on which the statistics in a given column are based is indicated in parentheses under the heading.

Abbreviations:

Area	Academic Area of Concentration.
<u>A</u>	Applied Science and Engineering Area.
<u>B</u>	Basic Science Area.
<u>N</u>	National Security and Public Affairs Area.
<u>H</u>	Humanities Area.
$r$pt. bis.	Correlation with area group membership. Point Biserial correlation coefficients, with cadets in the given area having a score of "1" and cadets in other areas a score of "0". A minimal estimate of the usual linear correlation coefficient (Pearson product - moment).
r_Q	Usual linear correlation of variable with indicated area QPA.
SD	Standard Deviation.
SE_M	Standard error of mean, SD of means of random samples of same size from population.

APPENDIX III Rokeach Value Basic Data

Rokeach Values	Applied Science Mean (198)	r pt. bis. (613)	r_AQ (198)	Basic Science Mean (67)	r pt. bis. (613)	r_BQ (67)	NS & PA Mean (274)	r pt. bis. (613)	r_NQ (274)	Humanities Mean (74)	r pt. bis. (613)	r_HQ (74)	Total Class Mean (613)	SD	SE M
T Comfortable	10.4	-0.06		10.9		.21	11.0		.25	11.4		(.14)	10.9	5.1	0.21
Accomplishment	8.9		.11	8.4		-.16	8.9			7.4	-0.10	(-.12)	8.7	4.7	0.19
Peace	10.0	0.05		10.6			9.7		-.10	10.0			9.9	5.0	0.20
Beauty	14.4	0.09	.13	14.2			14.0	-0.08		14.0			14.1	3.7	0.15
Equality	12.5		.17	12.0			11.5	-0.05	.14	11.7			11.9	4.5	0.18
Family Security	6.8		.12	7.0	0.06		7.3	(-.05)	.11	6.8	0.05	.20	7.1	4.1	0.16
Freedom	6.4			7.3			6.4			7.2		.16	6.6	4.0	0.16
Happiness	7.4			7.8		-.28	7.4		(.08)	7.5			7.5	4.3	0.18
Harmony	8.8		-.11	7.8	-0.06	(.14)	8.7	0.07	-.25	9.4	0.05	(-.13)	8.7	5.1	0.21
Love	6.7		-.19	6.4			7.2	-0.07	-.12	6.5			6.8	4.4	0.18
National Security	11.7	-0.14	.12	12.5	0.08	.17	11.2	0.08	.13	11.6	0.08		11.5	4.3	0.18
Pleasure	12.3			13.0		.23	13.5		(.03)	14.0		.33	13.1	4.1	0.16
Salvation	8.2		-.10	8.5			7.7			7.3		-.24	8.0	6.6	0.27
Self Respect	7.1			6.9	0.06		7.2		-.15	7.5			7.2	4.4	0.18
Social	14.0			14.6	-0.07		13.7			13.6			13.9	4.0	0.16
Friendship	7.4		-.11	6.6	-0.09	(.14)	7.5			7.5			7.4	3.8	0.16
Wisdom	8.1			6.8			8.3		-.17	7.9	-0.19		8.0	4.7	0.19
I Ambitious	9.5		.09	10.0		.36	9.3		.23	10.2			9.5	5.3	0.22
Broadminded	9.4			8.7		(.13)	9.1		(-.08)	8.9			9.1	4.5	0.18
Cheerful	11.5			11.3		(.14)	11.3			12.2	0.06		11.5	4.7	0.19
Clean	13.6	0.11	.11	14.7	0.09	.37	13.5		.12	12.6	-0.09		13.5	4.1	0.17
Courageous	8.5			8.3			7.2	-0.11		7.6		-.30	7.8	4.6	0.19
Forgiving	10.2			10.3		-.21	9.9			10.4			10.1	4.9	0.20
Helpful	10.2			11.1	0.07	-.28	10.1			10.0			10.2	4.4	0.18
Honest	3.5			3.9		-.17	3.9			4.1			3.8	3.5	0.14
Imagination	12.4	0.09		11.3		(.13)	11.7			11.1	-0.06	-.20	11.8	4.6	0.19

Since the scores are from rankings, NEGATIVE correlation coefficient indicates positive (direct) association with value's importance, and visa versa.

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APPENDIX III Rokeach Value Basic Data (Cont.)

Rokeach Values	Applied Science Mean (198)	rpt. bis. (613)	r_{AQ} (198)	Basic Science Mean (67)	rpt. bis. (613)	r_{BQ} (67)	NS & PA Mean (274)	rpt. bis. (613)	r_{NQ} (274)	Humanities Mean (74)	rpt. bis. (613)	r_{HQ} (74)	Total Class Mean (613)	SD	SE M
Independent	8.71	-.07		10.47	.09	.24	9.16		-.13	9.73			9.22	4.98	0.20
Intellectual	10.82	-.13	-.27	8.13	-.17		11.12	.08	(-.09)	10.93	.07	-.30	10.69	5.13	0.21
Logical	8.58		-.11	9.48			9.77	.07	-.10	10.34			9.42	4.54	0.19
Loving	8.38		-.11	8.50			8.22			7.61			8.23	5.45	0.22
Obedient	13.09	.06	.13	12.42			12.72			12.04	-.06	.16	12.73	4.18	0.17
Polite	13.10			13.68			12.89			12.93		.17	13.05	3.97	0.16
Responsible	4.76	-.08		4.74		(-.12)	5.60	.12		4.81			5.14	3.53	0.14
Self-controlled	7.19		.11	6.66	-.06		7.70	.06		7.69			7.42	4.49	0.18
Area QPA N	229			78			333			93			733		
Mean	3.1023			3.4769			2.7801			3.451			3.0101		
SEM	0.0389			0.0503			0.0315			0.0461					
SD	0.588			0.444			0.575			0.445					
Range	1.75-4.24			2.29-4.13			1.57-4.12			1.93-3.99			1.57-4.24		

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Data on Early Academic Performance at USMA used in developing Predicted Area Success Scales. Selected data on grades earned in courses that normally will be completed by end of third term; averages for courses by indicated academic department or group of departments.

Explanations:

(1) A positive correlation indicates that high grades on that course are directly associated with high scores on the criterion (group membership or QPA). A reported negative correlation indicates that low grades on that course are significantly associated with high scores on the criterion.

(2) Correlations within parentheses were not included in developing the computed scores. They are reported only for completeness.

(3) Most of the correlation coefficients used, those not within parentheses, are significant at on alpha level better than .001 for the two areas with the largest number of cadets (areas A & N). For the "B" and "H" areas some r's with lower obtained significance levels are included in the computed score keys.

(4) The courses included when computing a cadet's departmental average grade are underscored. The foreign language averages also included LX 141, 142, 151, and 152.

(5) The number of cases on which each $r$pt. bis. is based is that given in the Total Class N column.

Abbreviations:

Area	Academic Area of Concentration.
A	Applied Science and Engineering Area.
B	Basic Science Area.
N	National Security and Public Affairs Area.
H	Humanities Area.
$r$pt. bis.	Correlation with area group membership. Point biserial correlation coefficients, with cadets in the given area having a score of "1" and cadets in other areas a score of "0". An under estimate of the usual linear correlation coefficient. The maximums normally possible are about .78 for areas "A" and "N", and .60 for areas "B" and "H".
r_Q	Usual linear correlation of variable with indicated area QPA: the Pearson product-moment coefficient.
SD	Standard deviation.
SE M	Standard error of mean, SD of means of random samples of same size from population.

r_Q Usual linear correlation of variable with in-
               dicated area QPA, a Pearson product-moment
               coefficient.

SD   Standard Deviation.

M   Mean.

APPENDIX IV Data on Early USMA Academic Performance

Course	Applied Science No.A	Mean	rpt. bis.	r_Q	Basic Science Na.B	Mean	rpt. bis.	r_Q	NS & PA No.N	Mean	rpt. bis.	r_Q	Humanities No.H	Mean	rpt. bis.	r_Q	Total Class n_T	Mean	SD	SE_M
MA 101	147	2.58	(.33)	(.68)	43	2.61	(.20)	(.80)	246	2.40	(-.40)	(.47)	74	2.48		(.42)	510	2.48	.20	.01
102	85	2.45	(.26)	(.63)	24	2.50	(.22)	(.54)	215	2.32	(-.38)	(.36)	61	2.40		(.28)	385	2.38	.15	.01
151	62	2.67		(.54)	29	2.76	(.29)	(.73)	34	2.66	(-.12)	(.47)	11	2.64	(-.11)	(.84)	136	2.69	.13	.01
152	62	2.67	(.32)	(.67)	19	2.72	(.21)	(.74)	31	2.65	(-.15)	(.56)	14	2.69		(.17)	126	2.67	.10	.01
201	147	2.52	(.32)	(.80)	43	2.59	(.26)	(.84)	246	2.33	(-.44)	(.61)	75	2.43		(.47)	511	2.42	.20	.01
(202)	210	2.54	(.28)	(.84)	72	2.65	(.31)	(.86)	283	2.32	(-.42)	(.67)	85	2.41		(.66)	650	2.44	.24	.01
EN 101	199	2.33	(.33)		68	2.32		(.55)	261	2.33		(.53)	74	2.40	(.15)	(.67)	602	2.33	.15	.01
102	199	2.40	(.31)		68	2.40		(.42)	260	2.40		(.60)	73	2.47	(.17)	(.66)	600	2.41	.14	.01
151	22	2.62	(-.13)	(.16)	10	2.65		(.77)	25	2.63		(.48)	13	2.68	(.19)	(.62)	70	2.64	.09	.01
152	18	2.68	(-.22)	(.32)	6	2.72	(.10)		17	2.70		(.72)	7	2.75	(.23)	(.72)	48	2.70	.08	.01
201	221	2.41		(.50)	77	2.46	(.09)	(.62)	286	2.40	(-.15)	(.76)	87	2.51	(.21)	(.75)	671	2.42	.16	.01
(202)	11	2.62	(.10)	(.82)	3	2.57			5	2.50	(-.21)		1	2.90	(.27)		20	2.60	.26	.06
HI 201	86	2.39		(.61)	29	2.46		(.60)	144	2.41		(.82)	35	2.45		(.82)	264	2.41	.19	.01
203	105	2.49		(.52)	36	2.52		(.45)	133	2.46	(-.12)	(.82)	33	2.52		(.86)	265	2.49	.19	.01
202	86	2.49		(.65)	29	2.52		(.67)	115	2.48		(.82)	35	2.53		(.79)	307	2.48	.18	.01
204	108	2.47		(.46)	36	2.51		(.56)	135	2.46		(.82)	33	2.53	(.11)	(.83)	312	2.48	.18	.01
LX 101	110	2.43		(.24)	39	2.48	(.10)	(.58)	154	2.36	(-.28)	(.28)	42	2.60	(.31)	(.42)	345	2.43	.20	.01
102	112	2.44		(.37)	40	2.47	(.08)	(.70)	158	2.36	(-.31)	(.44)	41	2.62	(.34)	(.60)	351	2.42	.20	.01
SS (401)	13	2.53		(.55)	4	2.62	(.10)		27	2.54		(.60)	5	2.48			49	2.54	.25	.04
302	160	2.48		.54	50	2.52		(.68)	198	2.45		.72	60	2.48		.68	468	2.47	.20	.01
301	142	2.48		.57	43	2.55	(.13)	(.68)	206	2.43	(-.13)	.74	65	2.45		.60	456	2.46	.22	.01
EF (101)	171	2.54	(.30)	(.52)	67	2.57	(.22)	(.72)	270	2.36	(-.39)	(.43)	83	2.43		(.30)	591	2.45	.20	.01
102	170	2.59	(.31)	.74	66	2.64	(.25)	.76	270	2.39	(-.40)	.63	83	2.45		.47	589	2.48	.22	.01
PH 201	217	2.56	(.36)	.80	77	2.63	(.29)	.88	286	2.33	(-.47)	.72	87	2.41		.52	667	2.45	.22	.01
(203)	220	2.61	(.33)	(.80)	78	2.68	(.30)	(.85)	286	2.39	(-.47)	(.72)	87	2.48		(.63)	671	2.51	.21	.01
CH 201	162	2.62	(.34)	.76	47	2.69	(.26)	.86	258	2.39	(-.45)	.67	79	2.48		.58	546	2.50	.22	.01

*Except for the three English courses with small N's, all over-all P's were significant well beyond the .001 level.

APPENDIX IV (Cont.)

Dept. Averages	Applied Science				Basic Science				NS & PA				Humanities				Total Class			
	No.$_A$	Mean	rpt. bis.	r_Q	No.$_B$	Mean	rpt. bis.	r_Q	No.$_N$	Mean	rpt. bis.	r_Q	No.$_H$	Mean	rpt. bis.	r_Q	n_T	Mean	SD	SE_M
Mathematics	210	2.57	(.30)	.84	72	2.66	(.31)	.92	283	2.38	(-.45)	.66	85	2.46	(-.04)	.61	650	2.48		.20
English	222	2.40	(-.05)	.48	78	2.42	(.03)	.65	286	2.39	(-.11)	.77	87	2.49	(.20)	.79	673	2.41		.15
History 1	222	2.44	(-.03)	.52	78	2.49	(.08)	.55	316	2.44	(-.08)	.75	89	2.48	(.09)	.80	705	2.45		.18
History 2	226	2.46	(-.04)	(.58)	78	2.50	(.06)	(.61)	320	2.45	(-.07)	(.81)	89	2.51	(.10)	(.81)	713	2.46		.17
Foreign Language	221	2.44	(.01)	.43	77	2.47	(.10)	.66	317	2.36	(-.26)	.44	80	2.61	(.29)	.57	695	2.44		.18
Physical Science	222	2.60	(.36)	(.82)	78	2.65	(.29)	(.91)	286	2.38	(-.48)	(.71)	87	2.45	(-.08)	(.57)	673	2.49		.20
HI & SS	213	2.48	(-.01)	(.63)	74	2.52	(.09)	(.70)	273	2.46	(-.09)	(.90)	82	2.51	(.06)	(.78)	642	2.48		.17
Social Science	171	2.48	(.06)	(.62)	53	2.54	(.14)	(.70)	256	2.45	(-.13)	(.81)	72	2.46	(-.01)	(.65)	552	2.47		.19
Area QPA	229	3.10 SD=.59			78	3.48 SD=.44			333	2.78 SD=.58			93	3.22 SD=.44			NA	NA SD NA		

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Data on Relevant Pre-USMA Performance; selected data on variables available when evaluating candidates for admission to USMA.

Explanations:

(1) Only the High School Rank Score is available currently for almost all cadets in the Classes of 1978 and 1981, and this is the only one that can be used now.

(2) Three experimental computed variables were developed from the three groups of correlations underscored in the four r_Q columns (respectively College Entrance Examination Boards Tests, American College Testing Program Tests, and High School Academic Performance).

(3) The mean and standard deviation of Area QPA's also are presented for each area to facilitate relevant comparisons and interpretations.

(4) A positive correlation indicates that high scores on that interest scale are directly associated with high scores on the criterion (group membership or QPA). A reported negative correlation indicates that low scores on that interest scale are significantly associated with high scores on the criterion.

(5) A majority of the correlation coefficients are significant at an alpha level better than .001, even for the "B" and "H" areas.

(6) The number of cases on which the $r_{pt. bis.}$ statistics are based is the same as the Total Number in the class having that measure, as given in the last column.

Abbreviations:

Area	Academic Area of Concentration.
A	Applied Science and Engineering Area.
B	Basic Science Area.
N	National Security and Public Affairs Area.
H	Humanities Area.
$r_{pt. bis.}$	Correlation with area group membership. Point biserial correlation coefficients, with cadets in the given area having a score of "1" and cadets in other areas a score of "0". A minimal estimate of the usual linear correlation coefficient. The maximums normally are about .78 for areas "A & N", and about .60 for areas "B & H".
M	Mean.

APPENDIX V   Data On Relevant Pre-USMA Performance

	Applied Science & Engineering				Basic Sciences				National Security & Public Affairs				Humanities				Total Class
	No.$_A$	M/SD	$r_A$pt. bis.	r_{AQ}	No.$_B$	M/SD	$r_B$pt. bis.	r_{BQ}	No.$_N$	M/SD	$r_N$pt. bis.	r_{NQ}	No.$_H$	M/SD	$r_H$pt. bis.	r_{HQ}	No.
CEEB	209	619/53	(.19)	(.53)	75	636/64	(.19)	(.71)	275	577/66	(−.33)	(.64)	83	608/59	(.04)	(.46)	642
SAT-Verb	195	563/83	.00	.20	65	582/81	.08	.43	261	552/80	−.11	.58	79	581/83	.09	.39	600
SAT-Math	195	661/61	.23	.44	65	680/68	.21	.59	261	614/69	−.30	.41	79	628/64	−.06	.17	600
ACEER	95	616/56	(.28)	(.59)	39	613/65	(.14)	(.73)	111	557/76	(−.34)	(.58)	32	577/71	(−.05)	(.46)	277
ACT-Eng.	95	23.1/3.2	.18	.18	39	21.7/3.6	−.05	.57	111	21.4/4.0	−.18	.54	32	22.8/3.9	.06	.37	277
ACT-Math.	95	30.5/3.0	.29	.51	39	30.7/3.6	.18	.54	111	27.1/4.4	−.35	.45	32	27.9/3.8	−.09	.32	277
ACT-Soc. St.	95	27.0/3.5	.10	.26	39	27.4/4.3	.09	.37	111	25.3/5.4	−.19	.62	32	27.0/2.9	.05	.22	277
ACT-Nat. Sci.	95	29.8/3.3	.22	.41	39	29.6/3.9	.09	.29	111	27.4/4.3	−.25	.55	32	28.3/3.3	−.04	.36	277
High Sch. Avg. in																	
Eng	66	3.56/.64	.11	.14	30	3.33/.84	−.08	.51	87	3.43/.60	.04	.19	23	3.44/.73	−.01	.48	206
Math	69	3.48/.68	.12	.36	29	3.62/.62	−.15	.44	85	3.14/.82	−.23	.18	23	3.39/.66	.02	.46	206
Soc. St.	69	3.64/.54	−.07	−.08	28	3.64/.68	−.03	.29	84	3.73/.50	−.06	.24	22	3.77/.53	.05	.34	203
Nat. Sci.	68	3.49/.70	.10	.36	28	3.50/.69	.06	.17	79	3.25/.81	−.14	.36	21	3.38/.87	.00	.55	196
H.S. Rank Score	219	58.3/9	.10	.42	77	60.6/10	.13	.59	279	53.8/11	−.24	.48	86	59.1/10	.08	.42	661
Area QPA	229	3.10/.59			78	3.48/.44			333	2.78/.58			93	3.22/.45			

Percentage distributions of the standard scores made by the Class of 1978 cadets in each area of concentration, of those in the lower-half of their area groups on their Area QPA, and those in the four upper-half groups. Descriptive statistics are included for the largest complete data samples on which they were available from other analysis.

Distributions are shown by relative level in the scaling population in the indicated appendix sections for following standard scores:

Standard Scores	Appendix Sections	Page
Physical Science/Non-Physical Science (B/A - H/N SS's)	A	51
Predicted Area QPA (Area PQPASS's)	B-E	52
General Interest Area Compatibility (Area GISS's)	F-I	56
Occupational Interest Area Compatibility (Area OISS's)	J-M	60
Rokeach Values Area Compatibility (Area RVSS's)	N-Q	64

Appendix VI-A

Physical Science/Non Physical Science: Percentage Distributions by QPA Group

PHYSC Standard Score

Actual QPA Group	High Non Phy. Sc. 999-751 (High M/H)	750-651 (AVH/H)	650-551 (AVM/H)	550-451 (Neutral)	High Phy. Sc. 450-351 (AV.A/B)	350-001 (High A/B)	No. In Group	% In Group	Mean	SD	SE Mean
1 Lower ½ A QPA	%	—	17	41	34	7	41	16	466.07	83.44	13.03
2 Upper ½ A QPA	%	—		20	36	42	45	18	363.60	81.03	12.08
Total A	%	8	8	30	35	27	86	34	412.45	96.57	10.41
3 Lower ½ B QPA	%	8	8	15		69	13	5	444.77	86.92	24.11
4 Upper ½ B QPA	%	—		21	42	36	14	6	378.71	102.67	27.44
Total B	%	4	4	18	50	18	27	11	410.52	99.45	19.14
(Physical Science Areas)	(1)	(7)	(27)	(40)	(25)		(113)	(44)	412.99	96.82	9.11
5 Lower ½ N QPA	%	5	31	39	24	2	62	24	606.81	88.24	11.25
6 Upper ½ N QPA	%	4	25	33	27	8	51	20	586.92	104.52	14.65
Total M	%	4	28	36	26	5	113	44	597.83	96.00	9.03
7 Lower ½ H QPA	%	8	33	42	8	8	12	5	560.92	103.16	29.78
8 Upper ½ H QPA	%	6	12	41	24	18	17	7	566.35	110.03	26.69
Total H	%	7	10	31	31	10	3	29	11	564.10	105.39	19.57
(Non Physical Science Areas)	(5)	(25)	(37)	(27)	(6)	(1)	(142)	(56)	(590.94)	(98.55)	(8.27)
Total No							255	100	511.64	132.13	8.27
Total %	2.7	14.	23.5	27.0	4.2	11.4		100			

Appendix VI-B

Percentage Distributions of Predicted Applied Science
Area QPA Standard Scores by Actual QPA Group

Actual QPA Groups		Extremely Low 1-24	Very Low 25-34	Low 35-44	Average 45-54	High 55-64	Very High 65-100	No. In Group	% In Group	Mean	SD	SE Mean
1 Lower ½ A	%		9	38	49	4		55	18	43.87	6.82	0.92
2 Upper ½ A	%	—		5	35	47	13	60	19	56.87	8.26	1.07
Total A	%		4	21	42	26	7	115	37	50.65	10.04	0.94
3 Lower ½ B	%		5	26	53	16		19	6	47.67	7.59	1.74
4 Upper ½ B	%					32	65	17	6	65.61	6.96	1.69
Total B	%		3	14	28	25	31	36	12	56.14	11.72	1.95
5 Lower ½ N	%	12	46	26	1			65	21	30.99	6.29	0.78
6 Upper ½ N	%		14	32	37	17		59	19	44.91	9.83	1.28
Total N	%	6	38	29	18	8	—	124	40	37.61	10.77	0.97
7 Lower ½ H	%		25	56	19			16	5	38.89	6.84	1.71
8 Upper ½ H	%		6	24	29	24	18	17	5	53.55	12.15	2.95
Total H	%	—	15	39	24	12	9	33	11	46.44	12.54	2.18
Total	No/%	8/3	58/19	78/25	89/29	53/17	22/7	308	100	45.59	12.75	0.73

Appendix VI-C
Percentage Distributions of Basic Sciences
Area QPA Standard Scores by Actual QPA Group

Actual QPA Groups		Extremely Low 1-24	Very Low 25-34	Low 35-44	Average 45-54	High 55-64	Very High 65-100	No. In Group	% In Group	Mean	SD	SE Mean
1 Lower ½ A	%	2	8	51	37	2		79	17	41.89	6.63	0.74
2 Upper ½ A	%			10	51	35	4	77	17	52.48	6.38	0.73
Total A	%	1	4	31	44	19	2	156	34	47.12	8.42	0.67
3 Lower ½ B	%		10	34	55			29	6	43.25	6.19	1.15
4 Upper ½ B	%			4	27	50	18	22	5	58.90	6.42	1.37
Total B	%		6	19	39	19	7	51	12	50.00	10.08	1.34
5 Lower ½ N	%	7	57	33	3			101	22	32.57	5.93	0.59
6 Upper ½ N	%	1	13	42	35	9		95	21	43.93	8.28	0.85
Total N	%	4	36	37	18	5	—	196	43	38.08	9.17	0.66
7 Lower ½ H	%		10	79	10			29	6	38.32	5.07	.94
8 Upper ½ H	%			18	44	30	7	27	6	52.16	8.53	1.64
Total H	%		5	50	27	14	4	56	12	44.99	9.90	0.94
Total	No/%	10/2	82/18	160/35	141/31	57/12	9/2	459	100	43.32	10.19	0.48

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Appendix VI-D
Percentage Distributions of Predicted NSPA Area QPA Standard Scores by Actual QPA Group

Actual QPA Groups	Extremely Low 1-24	Very Low 25-34	Low 35-44	Average 45-54	High 55-64	Very High 65-100	No. In Group	% In Group	Mean	SD	SE Mean
1 Lower ½ A %		2	12	56	30		50	15	51.12	6.15	0.87
2 Upper ½ A %		1		28	38	34	58	18	60.73	8.13	1.07
Total A %	—	1	6	41	44	18	108	33	56.28	8.76	0.84
3 Lower ½ B %			29	35	35		17	5	52.12	7.50	1.82
4 Upper ½ B %					33	67	18	5	68.82	7.22	1.70
Total B %	—	—	14	17	34	34	35	11	60.71	11.29	1.91
5 Lower ½ N %		3	57	38	3		77	23	43.30	5.55	.63
6 Upper ½ N %			7	31	38	25	72	22	57.16	8.65	1.02
Total N %	—	1	33	28	19	12	149	45	50.00	9.91	0.81
7 Lower ½ H %			14	57	29		14	4	49.92	5.57	1.49
8 Upper ½ H %				13	35	52	23	7	65.41	8.71	1.81
Total H %	—	—	5	30	32	32	37	11	59.55	10.89	1.79
Total No/%		3/1	62/19	102/31	100/30	62/19	329	100	54.27	10.61	0.58

Appendix VI-E

Percentage Distributions of Predicted Humanities
Area QPA Standard Scores by Actual QPA Group

Actual QPA Groups	No./%	Extremely Low 1-24	Very Low 25-34	Low 35-44	Average 45-54	High 55-64	Very High 65-100	No. In Group	% In Group	Mean	SD	SE Mean
1 Lower ½ A	%	—	18	49	34			45	14	40.91	6.41	0.96
2 Upper ½ A	%		2	31	44	23		52	17	48.14	7.45	1.03
Total A	%	—	9	39	39	12		97	31	44.78	7.90	0.80
3 Lower ½ B	%		12	50	38			16	5	42.67	6.96	1.74
4 Upper ½ B	%				44	39	17	18	6	56.22	6.51	1.54
Total B	%	—	6	24	41	21	9	34	11	49.84	9.68	1.66
5 Lower ½ N	%		49	46	5			74	24	35.78	4.84	0.56
6 Upper ½ N	%		4	35	41	20		71	23	46.94	7.49	0.89
Total N	%	—	27	41	23	10		145	46	41.24	8.43	0.70
7 Lower ½ H	%			79	21			14	4	40.60	3.73	1.00
8 Upper ½ H	%				43	43	13	23	7	55.72	8.06	1.68
Total H	%	—		30	35	27	8	37	19	50.00	10.11	1.66
Total	No/%	—	50/16	116/37	98/31	43/14	6/2	313	100	44.31	9.18	0.52

Percentage Distributions of Area Compatibility Scores by QPA Group:
Appendix VI-F
General Interest Standard Scores
(AGISS)

Actual QPA Group		Extremely Low 1-24	Very Low 25-34	Low 35-44	Average 45-54	High 55-64	Very High 65-100	No. In Group	% In Group	Mean	SD	SE Mean
1 Lower ½ A	%		12	36	33	14	6	103	16	46.48	9.84	.97
2 Upper ½ A	%	1	7	19	42	25	6	102	16	49.83	9.69	.96
Total A	%	.5	9	27	38	19	6	205	32	48.15	9.93	.69
3 Lower ½ B	%	6	11	8	48	17	8	35	6	47.23	11.89	2.01
4 Upper ½ B	%		18	32	20	26	3	34	5	45.97	11.13	1.91
Total B	%	3	14	20	35	22	6	69	11	46.61	11.62	1.40
5 Lower ½ N	%	27	36	26	8	2	-	144	22	31.48	10.31	.86
6 Upper ½ N	%	34	37	20	10			142	22	29.30	10.59	.89
Total N	%	30	36	23	9	.7	-	286	45	30.40	10.52	.62
7 Lower ½ E	%	28	38	28	6	6	-	39	6	30.23	11.08	1.77
8 Upper ½ H	%	25	48	20	8			40	6	29.35	10.14	1.60
Total H	%	27	43	24	5	1	-	79	12	29.78	10.69	1.20
Total	No.	111	167	155	131	59	16	639				
	%	17	26	24	20	9	2		100	37.77	13.54	.54

Appendix VI-G

Percentage Distribution of Area Compatibility Scores by QPA Group:
General Interest Standard Scores
(BGISS)

Actual QPA Group		Extremely Low 1-24	Very Low 25-34	Low 35-44	Average 45-54	High 55-64	Very High 65-100	No. In Group	% In Group	Mean	SD	SE Mean
1 Lower ½ A	%	5	26	46	19	4		98	16	38.18	8.83	.89
2 Upper ½ A	%	2	16	33	35	14		98	16	43.49	9.31	.94
Total A	%	4	21	39	27	9	—	196	31	40.84	9.48	.68
3 Lower ½ B	%		9	39	21	27	3	33	5	47.42	11.37	1.98
4 Upper ½ B	%		2	26	44	12	12	34	5	49.47	9.61	1.65
Total B	%	—	6	34	33	19	7	67	11	48.46	10.64	1.30
5 Lower ½ N	%	33	42	18	6	.7		140	22	28.94	9.53	.81
6 Upper ½ N	%	27	42	20	7	2		150	24	30.43	10.66	.87
Total N	%	30	42	19	8	1	—	290	46	29.71	10.18	.60
7 Lower ½ H	%	30	35	20	12	3		40	6	30.62	11.76	1.86
8 Upper ½ H	%	23	38	26	13			39	6	31.79	10.72	1.72
Total H	%	27	37	23	13	1	—	79	12	31.20	11.35	1.28
Total	No.	115	196	173	107	36	5	632	100	35.34	12.08	.48
	%	18	31	27	17	6	.8					

Appendix VI-H

Percentage Distribution of Area Compatibility Scores by QPA Groups: General Interest Standard Scores (MGISS)

Actual QPA Group	Extremely Low 1-24	Very Low 25-34	Low 35-44	Average 45-54	High 55-64	Very High 65-100	No. In Group	% In Group	Mean	SD	SE Mean
1 Lower ½ A %	9	26	45	18	2	—	103	16	37.16	8.85	.87
2 Upper ½ A %	16	44	35	4	1	—	102	16	32.99	7.92	.78
Total A %	12	35	40	11	1	—	205	32	35.08	8.68	.61
3 Lower ½ B %	20	28	40	6	6	—	35	6	33.97	10.01	1.69
4 Upper ½ B %	24	44	24	9		—	34	5	30.62	9.76	1.67
Total B %	22	36	32	7	3	—	69	11	32.32	10.10	1.22
5 Lower ½ M %	1	6	20	37	28	8	144	23	50.28	10.22	.85
6 Upper ½ M %	.7	6	17	41	28	7	142	22	50.33	9.88	.83
Total M %	1	6	18	39	28	7	286	45	50.30	10.06	.59
7 Lower ½ H %	3	5	21	38	31	3	39	6	49.05	10.30	1.65
8 Upper ½ H %		13	35	35	15	3	40	6	46.08	9.82	1.55
Total H %	1	9	28	37	23	3	79	12	47.55	10.23	1.15
Total No.	441	121	119	168	101	23	639	100	43.14	12.28	.49
%	7	19	28	26	16	4					

Percentage Distribution of Area Compatibility Scores by QPA Group:
General Interest Standard Scores
(HGISS)

Appendix VI-I

Actual QPA Group		Extremely Low 1-24	Very Low 25-34	Low 35-44	Average 45-54	High 55-64	Very High 65-100	No. In Group	% In Group	Mean	SD	SE Mean
1	Lower ½ A %	43	31	21	4			109	15	27.36	9.97	.95
2	Upper ½ A %	55	27	12	6	1		109	15	25.72	10.29	.98
	Total A %	49	29	16	5	.4	—	218	31	26.54	10.19	.69
3	Lower ½ B %	34	42	13	16			38	5	28.34	10.49	1.70
4	Upper ½ B %	29	24	37	11			38	5	32.03	10.64	1.73
	Total B %	32	33	25	13	—	—	76	11	30.18	10.80	1.24
5	Lower ½ N %	6	23	36	25	9		162	23	40.04	9.75	.76
6	Upper ½ N %	4	17	31	29	17	1	162	23	43.28	10.92	.86
	Total N %	5	20	34	27	13	.6	324	46	41.66	10.49	.58
7	Lower ½ H %	2	14	37	21	19	5	43	6	45.00	11.89	1.81
8	Upper ½ H %	2	7	33	27	22	9	45	6	48.82	11.29	1.68
	Total H %	2	10	35	24	20	7	88	12	46.95	11.81	1.26
Total	No.	149	163	195	129	62	8	706	100	36.42	13.10	.49
	%	21	23	28	18	9	1					

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Appendix VI-J

Percentage Distribution of Area Compatibility Scores by QPA Group:
Occupational Interest Standard Scores
(AOISS)

Actual QPA Group		Extremely Low 1-24	Very Low 25-34	Low 35-44	Average 45-54	High 55-64	Very High 65-100	No. In Group	% In Group	Mean	SD	SE Mean
1 Lower ½ A	%	4	14	29	31	19	4	84	15	45.45	11.31	1.23
2 Upper ½ A	%	1	5	21	36	29	8	84	15	50.13	9.90	1.08
Total A	%	2	10	25	33	24	6	168	30	47.79	10.92	.84
3 Lower ½ B	%	4	18	7	39	25	7	28	5	47.39	11.55	2.18
4 Upper ½ B	%		12	30	33	18	6	33	6	46.91	10.43	1.82
Total B	%	2	15	20	36	21	7	61	11	47.13	11.05	1.41
5 Lower ½ N	%	35	30	24	10	2		131	23	30.11	11.50	1.01
6 Upper ½ N	%	39	31	20	9	2		131	23	28.32	12.20	1.07
Total N	%	37	30	22	10	2		262	46	29.22	11.91	.74
7 Lower ½ H	%	47	24	21	6		3	34	6	28.12	13.36	2.29
8 Upper ½ H	%	47	21	21	11			38	7	28.39	11.28	1.83
Total H	%	47	22	21	8		1	72	13	28.26	12.39	1.46
Total	No.	136	120	126	109	57	15	563	100	36.58	14.69	.62
	%	24	21	22	19	10	3					

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Appendix VI-K

Percentage Distributions of Area Compatibility Scores by QPA Group:
Occupational Interest Standard Score
(BOISS)

Actual QPA Group		Extremely Low 1-24	Very Low 25-34	Low 35-44	Average 45-54	High 55-64	Very High 65-100	No. In Group	% In Group	Mean	SD	SE Mean
1 Lower ½ A	%	10	23	31	23	10	1	86	15	39.89	11.29	1.22
2 Upper ½ A	%	3	11	29	34	20	2	90	16	45.40	9.90	1.04
Total A	%	7	17	30	29	15	2	176	30	42.70	10.99	.83
3 Lower ½ B	%	7	11	32	29	14	7	28	5	45.25	11.87	2.24
4 Upper ½ B	%		9	19	38	31	3	32	6	49.12	10.50	1.86
Total B	%	3	10	25	33	23	5	60	10	47.31	11.42	1.47
5 Lower ½ M	%	47	28	20	4	.7	—	132	23	25.77	12.04	1.05
6 Upper ½ M	%	48	27	17	6	1	—	139	24	26.50	12.15	1.03
Total M	%	48	28	19	5	1	—	271	46	26.14	12.12	.74
7 Lower ½ H	%	41	32	16	8	3	—	37	6	27.24	12.86	2.11
8 Upper ½ H	%	34	29	18	18	1		38	6	31.34	12.08	1.96
Total H	%	37	31	17	13	1	—	75	13	29.32	12.72	1.47
Total	No.	171	134	132	94	45	6	582	100	33.75	14.47	.60
	%	29	23	23	16	8	1					

Percentage Distributions of Area Compatibility Scores by QPA Group:
Occupational Interest Standard Scores
(NOISS)

Appendix VI-L

Actual QPA Group		Extremely Low 1-24	Very Low 25-34	Low 35-44	Average 45-54	High 55-64	Very High 64-100	No. In Group	% In Group	Mean	SD	SE Mean
1 Lower ½ A	%	8	34	36	18	4		84	15	36.83	9.26	1.01
2 Upper ½ A	%	20	45	27	8			85	15	32.80	8.02	.87
Total A	%	14	40	31	13	2	—	169	30	34.80	8.92	.69
3 Lower ½ B	%	19	33	30	19			27	5	34.04	10.05	1.93
4 Upper ½ B	%	30	37	27	7			30	5	31.33	8.48	1.55
Total B	%	25	35	28	12	—	—	57	10	32.61	9.44	1.25
5 Lower ½ N	%	1	5	24	33	31	5	132	23	49.67	9.60	.84
6 Upper ½ N	%	1	6	24	28	36	6	135	24	49.75	10.27	.88
Total N	%	1	7	24	31	33	6	267	47	49.71	9.96	.61
7 Lower ½ H	%	3	8	28	33	22	6	36	6	48.64	10.56	1.76
8 Upper ½ H	%	1	17	22	31	28	3	36	6	46.58	9.82	1.64
Total H	%	1	12	25	32	25	4	72	13	47.61	10.32	1.22
Total	No.	41	111	151	134	110	18	565		43.26	12.10	.51
	%	7	20	27	24	19	3		100			

Appendix VI-M

Percentage Distributions of Area Compatibility Scores by QPA Group: Occupational Interest Standard Scores (HOISS)

Actual QPA Group		Extremely Low 1-24	Very Low 25-34	Low 35-44	Average 45-54	High 55-64	Very High 64-100	No. In Group	% In Group	Mean	SD	SE Mean
1 Lower ½ A	%	20	38	28	10	2		88	15	32.78	9.64	1.03
2 Upper ½ A	%	24	50	22	3	1		92	15	30.02	8.59	.90
Total A	%	22	44	25	7	2		180	30	31.37	9.25	.69
3 Lower ½ B	%	21	41	26	9	3	—	34	6	32.65	8.48	1.46
4 Upper ½ B	%	14	36	33	17			36	6	34.14	9.34	1.56
Total B	%	17	39	30	13	1	—	70	12	33.42	9.03	1.08
5 Lower ½ N	%	2	14	34	35	13	2	140	23	43.79	9.84	.83
6 Upper ½ N	%	1	10	30	30	23	6	138	23	47.21	10.89	.93
Total N	%	1	12	32	33	18	4	278	46	45.49	10.53	.63
7 Lower ½ H	%	3	3	39	22	28	6	36	6	47.86	10.72	1.79
8 Upper ½ H	%	2	2	20	40	28	8	40	7	50.08	9.55	1.51
Total H	%	3	3	29	32	28	7	76	13	49.03	10.25	1.18
Total	No.	58	143	176	136	75	16	604	100	40.33	12.20	.50
	%	10	24	29	22	12	3					

Appendix VI-M

Percentage Distribution of Area Compatibility Scores by OPA Group: Rokeach Value Standard Scores (ARVSS)

Actual OPA Group	Extremely Low 1-24	Very Low 25-34	Low 35-44	Average 45-54	High 55-64	Very High 65-100	No. In Group	% In Group	Mean	SD	SE Mean
1 Lower ½ A	%	1	13	27	33	18	8	93	16	47.14	11.12	1.15
2 Upper ½ A	%		7	22	35	30	6	98	17	50.03	9.97	1.00
Total A	%	1	15	25	34	24	24	191	33	48.62	10.67	.77
3 Lower ½ B	%		10	36	36	19		31	5	46.55	8.49	1.52
4 Upper ½ B	%	3	16	42	29	6	3	31	5	42.48	10.36	1.86
Total B	%	2	13	39	32	13	2	62	11	44.52	9.77	1.24
5 Lower ½ M	%	3	14	38	34	11	0	131	22	42.92	9.19	.80
6 Upper ½ M	%	5	16	38	27	13	1	135	23	42.92	10.69	.92
Total M	%	4	15	38	30	12	1	266	45	42.92	10.00	.61
7 Lower ½ H	%		13	38	43	7		30	5	43.77	7.85	1.43
8 Upper ½ H	%	8	22	30	28	12		40	7	40.75	11.50	1.82
Total H	%	1	19	33	34	10		70	12	42.04	10.28	1.23
TOTAL								589	100	44.83	10.49	.43

"Normal" Distribution in Criterion Group (scaling population)

	Extremely Low 1-24	Very Low 25-34	Low 35-44	Average 45-54	High 55-64	Very High 65-100
	0.5%	5.5%	23.1%	38.2%	25.3%	7.4%

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Percentage Distribution of Area Compatibility Scores by QPA Group:
Appendix VI-O
Rokeach Value Standard Scores
(RVSS)

Actual QPA Group	Extremely Low 1-24	Very Low 25-34	Low 35-44	Average 45-54	High 55-64	Very High 65-100	No. In Group	% In Group	Mean	SD	SE Mean
1 Lower ½ A %	13	28	39	17	3		93	16	36.49	9.82	1.02
2 Upper ½ A %	9	24	30	27	10	—	98	17	39.76	10.84	1.09
Total A %	11	26	34	22	7		191	33	38.17	10.51	.76
3 Lower ½ B %	3	23	32	29	13	3	31	5	44.00	9.91	1.78
4 Upper ½ B %	3	3	16	39	36	3	31	5	50.06	9.95	1.79
Total B %	2	13	24	34	24	3	62	11	47.03	10.47	1.33
5 Lower ½ N %	11	39	28	18	4	0	22	22	36.16	10.68	.93
6 Upper ½ N %	11	26	36	19	8	0	23	23	38.16	10.85	.93
Total N %	10	32	32	18	6	0	266	45	37.18	10.83	.66
7 Lower ½ H %	17	27	33	17	3	3	30	5	36.27	13.09	2.39
8 Upper ½ H %	12	12	42	22	10	1	40	7	39.20	11.56	1.83
Total H %	10	13	27	14	5	1	70	12	37.94	12.41	1.48
Total N %	14	19	39	20	7	1	589	100	38.63	11.18	.46

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Appendix VI-P

Percentage Distribution of Area Compatibility Scores by QPA Group:
Rokeach Value Standard Scores
(NRVSS)

Actual QPA Group		Extremely Low 1-24	Very Low 25-34	Low 35-44	Average 45-54	High 55-64	Very High 65-100	No. In Group	% In Group	Mean	SD	SE Mean
1 Lower ½ A	%		4	39	32	20	4	93	16	47.71	9.43	.99
2 Upper ½ A	%		16	41	35	7	1	98	17	43.32	8.42	.85
Total A	%		10	40	34	14	3	191	33	45.46	9.22	.67
3 Lower ½ B	%		10	48	26	16		31	5	44.00	8.56	1.54
4 Upper ½ B	%	3	16	19	48	13	3	31	5	45.06	9.97	1.79
Total B	%	2	13	34	37	14	2	62	11	44.53	9.38	1.19
5 Lower ½ N	%		5	24	34	29	8	131	22	50.65	9.36	.82
6 Upper ½ N	%		4	28	37	21	10	135	23	49.99	9.99	.86
Total N	%	—	4	26	35	25	9	266	45	50.32	9.71	.60
7 Lower ½ H	%		3	33	43	20		30	5	47.77	8.13	1.48
8 Upper ½ H	%		8	25	32	20	15	40	7	50.05	10.42	1.65
Total H	%		5	29	37	20	9	70	12	49.07	9.64	1.15
Total	No/%							589	100	47.98	9.73	.40

Appendix VI-Q

Percentage Distribution of Area Compatibility Scores by QPA Group: Rokeach Value Standard Scores (HRVSS)

Actual QPA Group	Extremely Low 1-24	Very Low 25-34	Low 35-44	Average 45-54	High 55-64	Very High 65-100	No. In Group	% In Group	Mean	SD	SE Mean
1 Lower ½ A %	11	18	27	24	20		93	16	41.55	12.15	1.26
2 Upper ½ A %	12	19	36	23	8	1	98	17	39.88	11.54	1.16
Total A %	12	19	31	24	14	0	191	33	40.69	11.90	.86
3 Lower ½ B %		23	39	23	16		31	5	42.29	9.61	1.72
4 Upper ½ B %	6	39	13	32	10		31	5	43.06	10.77	1.93
Total B %	3	31	26	27	13	—	62	11	42.68	10.30	1.31
5 Lower ½ M %	1	18	40	27	14		131	22	42.96	9.78	.85
6 Upper ½ M %	4	21	28	30	16	0	135	23	42.93	10.83	.93
Total N %	3	20	34	28	15	0	266	45	42.94	10.35	.63
7 Lower ½ H %		17	23	47	13		30	5	45.03	8.86	1.62
8 Upper ½ H %	2	5	25	25	40	2	40	7	50.02	9.95	1.57
Total H %	1	10	24	34	29	1	70	12	47.88	9.88	1.18
Total No/%							589	100	42.77	10.93	.45

Appendix VII
Correlation to Equal-Interval Scale Conversion Table

Fisher's Z* Defining Interval Lower Limit	Corresponding Correlation Coefficient	Weight In Raw Score Equation
.00	.000	1
.05	.050	2
.10	.100	3
.15	.149	4
.20	.198	5
.25	.245	6
.30	.292	7
.35	.337	8
.40	.380	9
.45	.422	10
.50	.463	11
.55	.501	12
.60	.538	13
.65	.572	14
.70	.605	15
.75	.636	16
.80	.665	17
.85	.692	18
.90	.717	19
.95	.740	20
1.00	.762	21
1.05	.782	22
1.10	.801	23
1.15	.818	24
1.20	.844	25
1.25	.849	26
1.30	.862	27
1.35	.875	28
1.40	.886	29
1.45	.896	30
1.50	.906	31
1.55	.914	32
1.60	.922	33
1.65	.929	34
1.70	.936	35
1.75	.942	36
1.80	.947	37
1.85	.952	38
1.90	.957	39
1.95	.961	40

$$*Z = 1.1513 \log_{10} ((1+r)/(1-r))$$

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APPENDIX VIII
DISCRIMINANT ANALYSIS STATISTICS

The parts of this appendix present selected statistics from discriminant analyses. The following simplified discussion should help individuals with at least some degree of sophistication in mathematics to understand these statistics.

The general purpose of discriminant analysis is to select a set of possible predictor variables (by a process similar to multiple Regression) those variables that contribute significantly to classifying the members of a set of criterion groups into their actual groups. The specific mathematical objective is to weight and linearly combine the discriminant analysis forms simultaneously two special factor analyses (one of the predictor variables and another of the criterion groups) to identify the factors in the criterion group that are predictable by corresponding factors in the original predictor variables.

The maximum possible number of such common factors (orthogonal dimensions) is one less than the number of dependent criterion groups. The association between each predictor "factor score" from a discriminate function (the sum of the optimally weighted predictor variables) and membership in one of the set of criterion groups is called canonical correlation.

The discriminant analysis process develops a set of equations (matrix) for each of the common dimensions, which are referred to as discriminant functions. Once the discriminant function equations are derived for the known groups, a set of classification function equations can be derived which will permit the classification of new cases with unknown memberships.

Since each such function is a dimension, the mean score of a group on each function can theoretically be plotted in n-dimensional space (with "n" equal to the number of such functions) as a point called the group centroid. Similarly, a function score can be computed for each individual in a given group and "plotted" likewise in dimensional space. The n-dimensional centroid point for a group represents the central tendancy for the cluster of individual group member's "points" in this n-dimensional space.

Individuals whose corresponding points in space are closest to the centroid point for their group, are said to be correctly classified. Those whose corresponding point in space is a greater distance from their own group's centroid than from the centroid of another group are "misclassified," since their pattern on the predictor variables, as weighted for the discriminant function, is more like the pattern for another group than for their own. The closer an individual's point in space to the centroid for a group, the more similar his pattern (weighted profile) is to the correspondingly weighted pattern (on the selected original variables) for that group. Note that this is not necessarily the modal or most typical pattern. (It is the pattern of means, not actually the mean pattern.) When two discriminate functions (dimensions) account for most of the significant variance (as is commonly true for the discriminate analyses of area of concentration groups) then, a regular two axis plot meaningfully depicts the relationships.

The other important statistical terms in the tables are more commonly used statistics.

APPENDIX VIII PART A. DISCRIMINANT ANALYSIS SHOWING ACCURACY OF CLASSIFICATIONS OF CLASS OF 1978 CADETS INTO FOUR ACADEMIC AREAS OF CONCENTRATION
BASED ON EACH CADET'S FOUR PREDICTED AREA QPA STANDARD SCORES (PQPASS'S)

274A DISCRIMINANTS WITH QPA STANDARDIZED SCORES
274A DISCRIMINANT ANALYSIS .1 : WITH QPA STANDARDIZED SCORES
FILE   SPS27442 (CREATION DATE = 39/24/78)

10/01/78   PAGE   4

GROUP COUNTS

	GROUP 1 APPL SCI -ENGINEE	GROUP 2 BASIC SC IENCES	GROUP 3 NATL SEC -PUB AFF	GROUP 4 HUMANITI ES	TOTAL
COUNT	87.0000	26.0000	99.0000	28.0000	240.0000

MEANS

	GROUP 1 APPL SCI -ENGINEE	GROUP 2 BASIC SC IENCES	GROUP 3 NATL SEC -PUB AFF	GROUP 4 HUMANITI ES	TOTAL
APQPASS	50.8736	57.0000	37.5556	47.9286	45.7000
BPQPASS	47.3621	52.3072	34.1414	47.6786	44.3125
NPQPASS	56.2310	62.0385	49.9798	59.0429	54.9333
HPQPASS	45.0000	49.9615	40.9091	49.3929	44.3625

STANDARD DEVIATIONS

	GROUP 1 APPL SCI -ENGINEE	GROUP 2 BASIC SC IENCES	GROUP 3 NATL SEC -PUB AFF	GROUP 4 HUMANITI ES	TOTAL
APQPASS	10.0044	11.8457	10.9807	12.8983	13.0622
BPQPASS	8.1214	10.9024	9.4997	10.6007	10.7009
NPQPASS	8.7481	11.5932	10.7228	11.3046	11.0860
HPQPASS	7.4833	9.9899	9.4854	10.2391	9.1335

WILKS' LAMBDA (U-STATISTIC) AND UNIVARIATE F-RATIO WITH 3 AND 236 DEGREES OF FREEDOM

VARIABLE	WILKS' LAMBDA	F
APQPASS	0.6970	34.1926
BPQPASS	0.7499	26.2409
NPQPASS	0.8396	15.0253
HPQPASS	0.8626	12.5317

274A DISCRIMINANTS WITH QPA STANDARDIZED SCORES
274A DISCRIMINANT ANALYSIS 1 , WITH QPA STANDARDIZED SCORES

WITHIN GROUPS CORRELATION MATRIX

	APQPASS	BPQPASS	NPQPASS	HPQPASS
APQPASS	1.0000			
BPQPASS	0.9635	1.0000		
NPQPASS	0.9468	0.9584	1.0000	
HPQPASS	0.8901	0.9063	0.9571	1.0000

- - - - - - - - - - D I S C R I M I N A N T   A N A L Y S I S - - - - - - - - - - - - - - -

ANALYSIS NUMBER   1

F FOR INCLUSION   1.00000

F FOR DELETION   1.00000

TOLERANCE LEVEL   0.00100

MAXIMUM STEPS   8

SOLUTION METHOD - STEPWISE. SELECT VARIABLE WHICH WILL
MAXIMIZE MINIMUM MAHALANOBIS DISTANCE BETWEEN GROUP PAIRS.

NOTE   THE ENTRY CRITERIA CURRENTLY BEING PRINTED ARE (USABLE) INTERMEDIATE RESULTS.

PRIOR PROBABILITIES -

GROUP 1	GROUP 2	GROUP 3	GROUP 4
APPL SCI	BASIC SC	NATL SEC	HUMANITI
ENGINEE	IENCES	PU3 AFF	ES
0.25000	0.25000	0.25000	0.25000

274A DISCRIMINANTS WITH GPA STANDARDIZED SCORES

274A DISCRIMINANT ANALYSIS -1 , WITH GPA STANDARDIZED SCORES

FILE   SPS274A2 (CREATION DATE = 05/24/78)

- - - - - - - - - - D I S C R I M I N A N T   A N A L Y S I S - - - - - - - - -

SUMMARY TABLE

STEP NUMBER	VARIABLE ENTERED REMOVED	F TO ENTER OR REMOVE	NUMBER INCLUDED	WILKS' LAMBDA	SIG.	RAO'S V	CHANGE IN RAO'S V	SIG. OF CHANGE
1	APQPASS	34.19257	1	0.69703	0.422E-14	102.57771	102.57771	0.
2	BPQPASS	7.94654	2	0.63264	0.321E-16	130.31091	27.73321	0.000
3	HPQPASS	22.28981	3	0.49219	0.	219.32468	89.01377	0.000
4	NPQPASS	7.08883	4	0.45102	0.	257.64629	38.32161	0.000

CLASSIFICATION FUNCTION COEFFICIENTS

	GROUP 1 APPL SCI ENGINES	GROUP 2 BASIC SC IENCES	GROUP 3 NATL SEC PUB AFF	GROUP 4 HUMANITI ES
APQPASS	-0.71848	-0.58009	-1.12873	-1.15611
BPQPASS	0.28489	0.19044	0.11674	-0.31074
NPQPASS	1.20107	1.06037	1.60757	1.44201
HPQPASS	-0.21904	-0.05453	-0.10520	-0.04025
CONSTANT	-17.80260	-19.97775	-19.05258	-23.69937

DISCRIMINANT FUNCTION	EIGENVALUE	RELATIVE PERCENTAGE	CANONICAL CORRELATION	FUNCTIONS DERIVED	WILKS' LAMBDA	CHI-SQUARE	DF	SIGNIFICANCE
				0	0.4510	187.118	12	0.
1	0.96551	88.44	0.201	1	0.8865	28.316	6	0.000
2	0.10940	10.02	0.314	2	0.9835	3.998	2	0.141
3	0.01631	1.54	0.129					

REMAINING COMPUTATIONS WILL BE BASED ON 3 DISCRIMINANT FUNCTION(S)

STANDARDIZED DISCRIMINANT FUNCTION COEFFICIENTS

	FUNC 1	FUNC 2	FUNC 3
APQPASS	2.14331	-1.17765	3.40742
BPQPASS	0.44872	-0.94553	-4.30290
NPQPASS	-1.70883	0.90322	-0.76671
HPQPASS	-0.27915	-1.84045	1.73113

274A DISCRIMINANTS WITH QPA STANDARDIZED SCORES
274A DISCRIMINANT ANALYSIS 1 WITH QPA STANDARDIZED SCORES

UNSTANDARDIZED DISCRIMINANT FUNCTION COEFFICIENTS

	FUNC 1	FUNC 2	FUNC 3
APQPASS	0.16408	0.09014	0.26086
BPQPASS	0.04193	-0.08834	-0.40211
NPQPASS	-0.15415	0.07245	-0.06916
HPQPASS	-0.03045	-0.20151	-0.18954
CONSTANT	0.46202	4.75452	1.28790

CENTROIDS OF GROUPS IN REDUCED SPACE

	FUNC 1	FUNC 2	FUNC 3
GROUP 1 APPL SCI-ENGINEE	0.67039	0.16906	-0.09506
GROUP 2 BASIC SCIENCES	0.92367	-0.30117	0.30264
GROUP 3 NATL SEC-PUB AFF	-0.72641	0.14803	0.04491
GROUP 4 HUMANITIES	-0.37233	-0.76892	-0.14445

PREDICTION RESULTS

ACTUAL GROUP	NO. OF CASES	PREDICTED GROUP MEMBERSHIP GP. 1	GP. 2	GP. 3	GP. 4
GROUP 1 APPL SCI-ENGINEE	47.	41. 47.1%	27. 31.0%	11. 12.6%	8. 9.2%
GROUP 2 BASIC SCIENCES	26.	7. 26.9%	14. 53.8%	1. 3.8%	4. 15.4%
GROUP 3 NATL SEC-PUB AFF	99.	11. 11.1%	2. 2.0%	63. 63.6%	23. 23.2%
GROUP 4 HUMANITIES	28.	4. 14.3%	2. 7.1%	10. 35.7%	12. 42.9%

PERCENT OF "GROUPED" CASES CORRECTLY CLASSIFIED   54.17%

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274A DISCRIMINANT ANALYSIS   1 , WITH GPA STANDARDIZED SCORES

TERRITORIAL MAP OF DISCRIMINANT SCORE 1 (HORIZONTAL) VS. DISCRIMINANT SCORE 2 (VERTICAL). * INDICATES A GROUP CENTROID.

Axis labels (top): 3.000   2.250   1.500   0.750   0.   -0.750   -1.500   -2.250   -3.000

Axis labels (left/bottom): -3.000   -1.500   0.   1.500   3.000   2.250   1.500   0.750   0.   -0.750   -1.500   -2.250   -3.000   -2.250   0.750

Group labels on plot: NS&PA, A S & E, BS, H
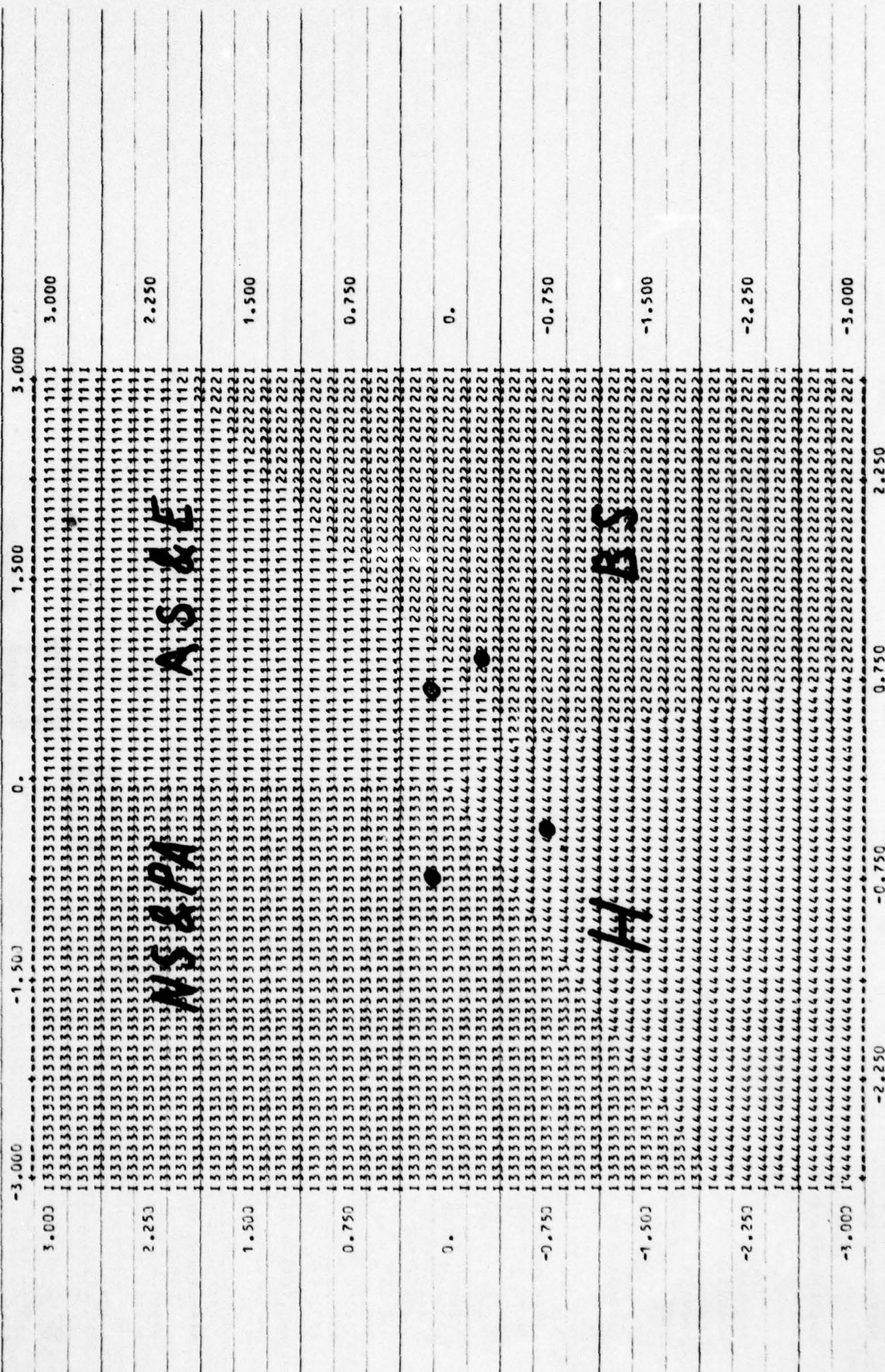
PART B. ACCURACY OF CLASSIFICATION OF CADETS HAVING ABOVE MEDIAN AREA QPA'S INTO A "PHYSICAL SCIENCE AREAS GROUP" (ASE & BS AREAS) CONTRA "OTHER SCIENCE AREAS GROUP" (NSPA & H,AREAS) BY DISCRIMINANT ANALYSIS USING EACH CADET'S 12 AREA COMPATIBILITY STANDARD SCORES.

274A DISCRIMINANTS CLUSTER AND HIRANK WITH STANDARDIZED SCORES   09/12/78   PAGE   4
274A DISCRIMINANT ANALYSIS CLUSTER WITH STANDARDIZED SCORES
FILE   SPS274A2 (CREATION DATE = 03/24/78)

GROUP COUNTS

	GROUP 1	GROUP 2	TOTAL
COUNT	75.0000	98.0000	173.0000

MEANS

	GROUP 1	GROUP 2	TOTAL
ASRVSS	48.0933	42.4496	45.1792
BSRVSS	42.5200	38.4644	40.2254
NPRVSS	45.6000	49.6936	47.0000
HURVSS	39.9733	45.3573	43.0289
ASGISS	47.4400	30.4344	37.8092
BSGISS	43.1362	31.5673	36.7746
NPGISS	33.2000	47.8163	41.4798
HUGISS	29.2133	43.7143	37.6277
ASOISS	48.8533	28.0612	37.0751
BSOISS	46.5367	28.1020	36.1156
NPOISS	52.5067	43.9592	41.7399
HUOISS	32.2000	48.1939	41.2601

STANDARD DEVIATIONS

	GROUP 1	GROUP 2	TOTAL
ASRVSS	10.6377	10.8931	11.1066
BSRVSS	11.9462	11.4821	11.6239
NPRVSS	8.5132	10.5746	10.2963
HURVSS	11.3077	11.3967	11.6382
ASGISS	9.3263	2.8578	12.7614
BSGISS	9.1337	10.3661	11.3199
NPGISS	7.6300	9.8644	11.5192
HUGISS	9.6745	10.5498	12.4994
ASOISS	10.5592	12.0829	15.3978
BSOISS	10.3435	10.6528	15.0402
NPOISS	2.4973	10.3325	12.7579
HUOISS	9.2590	10.8492	12.9015

274A DISCRIMINANT CLUSTER AND HIMAN WITH STANDARDIZED SCORES   6/12/75   PAGE 5
274A DISCRIMINANT ANALYSIS CLUSTER WITH STANDARDIZED SCORES

WILKS' LAMBDA (U-STATISTIC) AND UNIVARIATE F-RATIO WITH 1 AND 171 DEGREES OF FREEDOM

VARIABLE	WILKS' LAMBDA	F
ASRVSS	0.9222	14.2774
BSRVSS	0.9713	5.1051
NPRVSS	0.9104	16.9033
HURVSS	0.9407	9.5312
ASGISS	0.5676	132.3802
BSGISS	0.7530	56.0504
NPGISS	0.6025	112.7036
HUGISS	0.6675	85.1013
ASOISS	0.5490	140.1570
BSOISS	0.9252	101.7715
NPOISS	0.5792	124.2547
HUOISS	0.6204	104.6333

WITHIN GROUPS CORRELATION MATRIX

	ASRVSS	BSRVSS	NPRVSS	HURVSS	ASGISS	BSGISS	NPGISS	HUGISS	ASOISS	BSOISS
ASRVSS	1.0000									
BSRVSS	-0.3475	1.0000								
NPRVSS	-0.7022	-0.4510	1.0000							
HURVSS	-0.4245	-0.0545	0.3610	1.0000						
ASGISS	0.2055	0.1375	-0.2250	-0.1322	1.0000					
BSGISS	-0.0404	0.3333	-0.0624	0.0193	0.5667	1.0000				
NPGISS	0.0402	-0.2292	0.1454	0.0193	-0.7633	-0.3426	1.0000			
HUGISS	-0.2710	0.1651	0.1707	0.2004	-0.7900	-0.1360	0.3762	1.0000		
ASOISS	-0.1405	0.1651	-0.1685	-0.0741	-0.9301	0.0488	-0.7959	-0.7697	1.0000	
BSOISS	0.1470	0.3156	-0.5292	-0.0112	0.7328	0.0420	-0.9362	-0.3745	0.8311	1.0000
NPOISS	-0.0374	-0.2651	0.1404	0.0387	-0.0464	-0.9315	0.9241	0.5235	-0.9209	-0.9731
HUOISS	0.1904	-0.0727	0.1001	0.1567	-0.5034	-0.7226	0.4420	0.9229	-0.8630	-0.5060

	NPOISS	HUOISS
NPOISS	1.0000	
HUOISS	0.0206	1.0000

274A DISCRIMINANTS CLUSTER AND MIRANK WITH STANDARDIZED SCORES   09/12/76   PAGE   6
274A DISCRIMINANT ANALYSIS CLUSTER WITH STANDARDIZED SCORES
FILE   SPS27442 (CREATION DATE = 05/24/76)

- - - - - - - - - - - - - - - - D I S C R I M I N A N T   A N A L Y S I S - - - - - - - - - -

ANALYSIS NUMBER   1

SOLUTION METHOD - DIRECT.

PRIOR PROBABILITIES -

    GROUP   1   GROUP   2

    0.50000   0.50000

DISCRIMINANT FUNCTION	EIGENVALUE	RELATIVE PERCENTAGE	CANONICAL CORRELATION	FUNCTIONS DERIVED	WILKS' LAMBDA	CHI-SQUARE	DF	SIGNIFICANCE
				0	0.3153	105.410	12	0.339E-20
1	0.94079	100.00	0.696					

REMAINING COMPUTATIONS WILL BE BASED ON   1 DISCRIMINANT FUNCTION(S)

STANDARDIZED DISCRIMINANT FUNCTION COEFFICIENTS

              FUNC 1
ASRVSS   0.05264
BSRVSS   -0.04361
NPPVSS   -0.05540
HURVSS   -0.05624
ASGISS   -0.40113
BSGISS   -1.19441
NPGISS   -0.24717
HUGISS   -0.15226
ASOISS   0.16643
BSOISS   -0.31502
NPOISS   -0.25552
HUOISS   -0.24198

2744 DISCRIMINANTS CLUSTER AND MIRANK WITH STANDARDIZED SCORES
274A DISCRIMINANT ANALYSIS CLUSTER WITH STANDARDIZED SCORES

UNSTANDARDIZED DISCRIMINANT FUNCTION COEFFICIENTS

	FUNC 1
ASRVSS	0.00530
BSRVSS	-0.00369
NPRVSS	-0.00927
NURVSS	-0.00622
ASGISS	-0.03605
BSGISS	-0.01717
NPGISS	-0.08222
NUGISS	-0.00847
ASOISS	0.01081
BSOISS	-0.05426
NPOISS	-0.07500
NUOISS	-0.01676
CONSTANT	11.52781

CENTROIDS OF GROUPS IN REDUCED SPACE

	FUNC 1
GROUP 1	0.74356
GROUP 2	-0.60732

DIRECTORY OF PLOT SYMBOLS --

SYMBOL	GROUP	LABEL
1	1	AREA "AS" AND AREA "BS" CADETS WITH AN AREA QPA IN HIGH HALF FOR THEIR AREA (PHYSICAL SCIENCE AREAS)
2	2	AREA "NSPA" AND AREA "H" CADETS WITH AREA QPA IN HIGH HALF FOR THEIR AREA (OTHER SCIENCE AREAS)
U		ALL UNGROUPED CASES
.		CENTROIDS

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PLOT OF DISCRIMINANT SCORE 1 (HORIZONTAL) VS. DISCRIMINANT SCORE 2 (VERTICAL). * INDICATES A GROUP CENTROID.

274A DISCRIMINANTS CLUSTER AND MIRANK WITH STANDARDIZED SCORES   09/12/76   PAGE 16
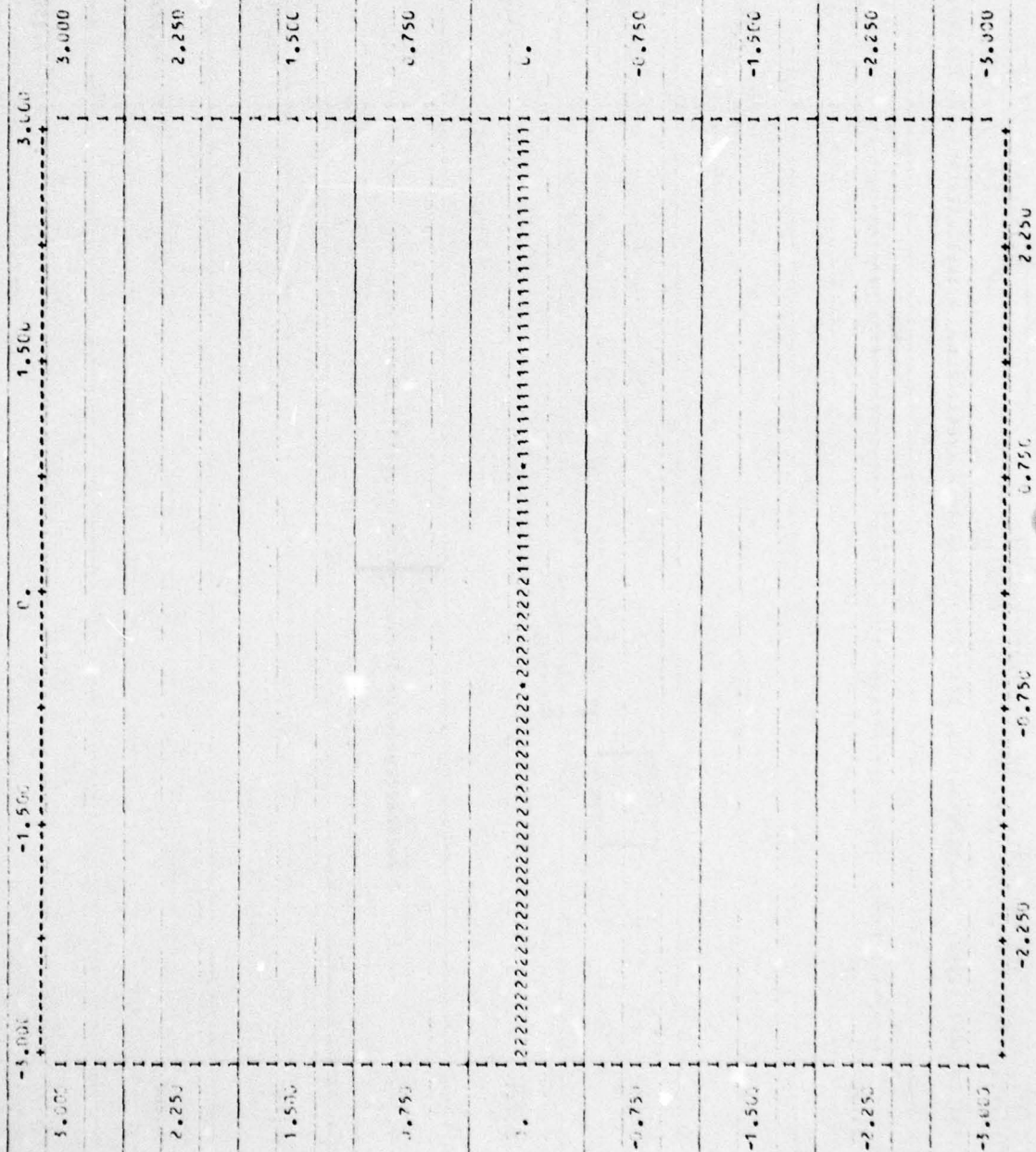274A DISCRIMINANT ANALYSIS CLUSTER WITH STANDARDIZED SCORES

TERRITORIAL MAP OF DISCRIMINANT SCORE 1 (HORIZONTAL) VS. DISCRIMINANT SCORE 2 (VERTICAL). * INDICATES A GROUP CENTROID.

274A DISCRIMINANTS CLUSTER AND MTRANK WITH STANDARDIZED SCORES   09/12/73   PAGE 17
274A DISCRIMINANT ANALYSIS CLUSTER WITH STANDARDIZED SCORES

PREDICTION RESULTS -

ACTUAL GROUP	NO. OF CASES	PREDICTED GROUP MEMBERSHIP	
		GP. 1	GP. 2
GROUP 1	75.	63.\n84.0%	12.\n16.0%
GROUP 2	98.	23.\n23.5%	75.\n76.5%
UNGROUPED CASES	154.	68.\n44.2%	86.\n55.8%

PERCENT OF "GROUPED" CASES CORRECTLY CLASSIFIED   79.77%

CADETS IN "HIGH HALF" FOR AREAS "A" AND "B"

CADETS IN HIGH HALF AREAS "HSPA" AND "H"

A HAND COUNT SHOWED THAT 70% OF THE "UNGROUPED" CASES (I.E. OF THE CADETS WITH AN AREA QPA IN A "LOW HALF" SUBGROUP) ALSO WERE CORRECTLY CLASSIFIED
IN THESE A-B CONTRA "H-H" AREA GROUPS

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APPENDIX IX

Intercorrelations Between Computed Area Scores
(Intercorrelations between scores of same type are given in Tables 2, 3 and 4)

	AGISS	BGISS	NGISS	HGISS	AOISS	BOISS	NOISS	HOISS	ARVSS	BRVSS	NRVSS	HRVSS	PHYSCSS
AOISS	.96	.75	-.88	-.86									
BOISS	.83	.92	-.95	-.61									
NOISS	-.90	-.87	.95	.70									
HOISS	-.89	-.53	.72	.94									
ARVSS	.28	.14	-.15	-.32	.22	.16	-.17	-.25					
BRVSS	.09	.25	-.19	.01	.14	.23	-.22	-.07					
NRVSS	-.27	-.23	.22	.22	-.21	-.22	.22	.19					
HRVSS	-.16	-.08	.13	.18	-.17	-.09	.09	.16					
APQPASS	.41	.49	-.48	-.27	.39	.49	-.48	-.25	.15	.33	-.33	-.10	.70
BPQPASS	.30	.40	-.38	-.21	.26	.35	-.33	-.17	.09	.27	-.24	-.02	.59
NPQPASS	.10	.29	-.23	-.04	-.08	.23	-.21	.04	.001	.27	-.18	-.02	.46
HPQPASS	.01	.24	-.21	-.16	-.04	.17	-.11	.12	-.16	.34	-.08	-.07	.32
PHYSCSS	.89	.69	-.82	-.79	.88	.80	-.85	-.80	.33	.25	-.37	-.39	
N	639	632	639	706	563	582	565	604	589	589	589	589	255
Mean	37.77	35.34	43.14	36.42	36.58	33.75	43.26	40.33	44.83	38.63	47.98	42.77	51.16
SD	13.54	12.08	12.28	13.10	14.69	14.47	12.10	12.20	10.49	11.18	9.73	10.93	13.21

SECURITY CLASSIFICATION OF THIS PAGE *(When Data Entered)*

REPORT DOCUMENTATION PAGE		READ INSTRUCTIONS BEFORE COMPLETING FORM
1. REPORT NUMBER 79-006	2. GOVT ACCESSION NO.	3. RECIPIENT'S CATALOG NUMBER
4. TITLE *(and Subtitle)* The Development of Guidance Materials for Cadets in the Selection of Their Area of Concentration		5. TYPE OF REPORT & PERIOD COVERED
		6. PERFORMING ORG. REPORT NUMBER
7. AUTHOR(s) Claude F. Bridges		8. CONTRACT OR GRANT NUMBER(s)
9. PERFORMING ORGANIZATION NAME AND ADDRESS Office of the Director of Institutional Research United States Military Academy West Point, New York 10996		10. PROGRAM ELEMENT, PROJECT, TASK AREA & WORK UNIT NUMBERS 274
11. CONTROLLING OFFICE NAME AND ADDRESS Same as #9 Above.		12. REPORT DATE June 1979
		13. NUMBER OF PAGES ix + 84
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		15a. DECLASSIFICATION/DOWNGRADING SCHEDULE

16. DISTRIBUTION STATEMENT *(of this Report)*

Approved for public release; distribution unlimited.

17. DISTRIBUTION STATEMENT *(of the abstract entered in Block 20, if different from Report)*

18. SUPPLEMENTARY NOTES

19. KEY WORDS *(Continue on reverse side if necessary and identify by block number)*

Academic Prediction	Prediction	Statistical Procedures
College Majors	Profiles	Strong-Campbell
Educational Guidance	Psychometric Techniques	Interest Inventory
Interest Patterns	Rokeach Value Survey	Value Systems
Non-cognitive Measures	Service Academies	

20. ABSTRACT *(Continue on reverse side if necessary and identify by block number)*

A guidance program and techniques to assist cadets in selecting the area of concentration most compatible with their profile of measured interests, values and academic capabilities were developed on the Class of 1978 and cross-validated by application to the Class of 1979.

The new measures of compatibility between a cadet's pattern on selected interests and values and the pattern of cadets typical of those successful in

DD FORM 1473 1 JAN 73   EDITION OF 1 NOV 65 IS OBSOLETE

SECURITY CLASSIFICATION OF THIS PAGE *(When Data Entered)*

the two more popular areas of concentration (the Applied Science and Engineering area and the National Security and Public Affairs area) had high validity (respective r's = $.71$ and $.67$), on the Class of 1978 from which a sample was used to develop the techniques and high cross validity on the Class of 1979 (respective r's = $.68$ and $.65$)., Compatibility scores developed for both the Basic Sciences and Humanities areas were based on samples that would be completely inadequate in size if the traditional techniques were used. However, their respective validities on the Class of 1978 were $.68$ and $.64$ and their cross validities were still promising ($.34$ and $.31$), but indicated that further refinement is necessary.

The four area Predicted Quality Point Averages had exceptionally high validities and cross validities ranging from $.86$ to $.93$ for the Class of 1978 and cross validities of $.79$ to $.92$ when applied to the Class of 1979.

A Physical Science Areas/Non-Physical Science Areas Score (A,B/N,H) had a correlation of $.90$ for the developmental sample, $.85$ for the total Class of 1978 and $.83$ for the Class of 1979.

Such consistently high validities indicate high potential for improving the matching of a cadet's special characteristics with his area of concentration and increasing his satisfaction and success at West Point.

A new statistic is presented that indicates the reliability of differences between scores on two scales, based on the correlation between the two and on their two reliability coefficients.

Further developments will follow trial use of the techniques to help guide the Class of 1981 Cadets in choosing their area of academic concentration.